DOCUMENT RESUME

ED 225 830 SE 040 189

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TITLE	Comparative Test Data: Fourth Grade. Evaluation Report 6-B-1. Extended Pilot Trial of the Comprehensive School Mathematics Program.
INSTITUTION	CEMREL, Inc., St. Louis, Mo.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C.
PUB DATE	Dec 79
NOTE	168p.; For related documents, see SE 040 181-196 and SE 040 340-348.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC07 Plus Postage.
DESCRIPTORS	Educational Research; *Elementary School Mathematics; Evaluation Methods; *Grade 4; Intermediate Grades; *Mathematics Achievement; Mathematics Curriculum; Mathematics Instruction; *Program Evaluation; *Quantitative Tests
IDENTIFIERS	*Comprehensive School Mathematics Program; *Mathematics Education Research

ABSTRACT

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories, and was funded by the National Institute of Education (NIE). Its major purpose is the development of curriculum materials for grades kindergarten through 6. At the end of the 1978-1979 school year, a series of tests was administered to fourth-grade CSMP classes and comparable non-CSMP classes. Two-thirds of those CSMP classes which had been using the program as their regular curriculum since at least the second grade were included. Among the results, non-CSMP classes did better, at the .05 level of significance, on the Stanford Achievement Test, while CSMP pupils did significantly better on the other computation scales, as well as on measures of mental arithmetic and fractions. Analysis indicates results consistent with those from other grade levels, and appears to indicate that CSMP promotes improvement in several mathematical thinking processes viewed as important, with minimal loss in the usual areas of study. (MP)

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EXTENDED PILOT TRIALS OF THE COMPREHENSIVE SCHOOL MATHEMATICS PROGRAM:

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Evaluation Report 6-B-1
Comparative Test Data: Fourth Grade

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Extended Pilot Trial of the Comprehensive School Mathematics Program

Evaluation Report 6-B-1

Comparative Test Data: Fourth Grade

Martin Herbert

December, 1979

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Description of Evaluation Report Series

The Comprehensive School Mathematics Program (CSMP) is a program of CEMREL, Inc., one of the national educational laboratories, and is funded by the National Institute of Education. Its major purpose is the development of curriculum materials for grades K-6.

Beginning in September, 1973, CSMP began an extended pilot trial of its Elementary Program. The pilot trial is longitudinal in nature; students who began using CSMP materials in kindergarten or first grade in 1973-74, were able to use them in first and second grades respectively in 1974-75, and so on in subsequent years. Hence the adjective "extended".

The evaluation of the program in this extended pilot trial is intended to be reasonably comprehensive and to supply information desired by a wide variety of audiences. For that reason the reports in this series are reasonably non-technical and do not attempt to widely explore some of the related research issues. The list of reports from the first two years of the extended pilot trial is given on the next page. The most comprehensive of these are the following:

1-A-1: Overview, Design and Instrumentation
1-A-3: Final Summary Report, Year 1
2-A-1: Final Summary Report, Year 2
3-B-1: Summary of Second and Third Grade Test Data Year 3
4-A-1: Final Summary Report, Year 4
5-B-1: Fourth Grade MANS Test Data
and 6-A-1: Summary of Evaluation Data Through Fourth Grade

Longitudinal Pilot Study of the Comprehensive School Mathematics Program

Evaluation Report Series

Evaluation Report 1-A-1	Overview, Design and Instrumentation
Evaluation Report 1-A-2	External Review of CSMP Materials
Evaluation Report 1-A-3	Final Summary Report Year 1
Evaluation Report 1-B-1	Mid-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-2	End-of-Year Test Data: CSMP First Grade Content
Evaluation Report 1-B-3	End-of-Year Test Data: Standard First Grade Content
Evaluation Report 1-B-4	End-of-Year Test Data: CSMP Kindergarten Content
Evaluation Report 1-B-5	Test Data on Some General Cognitive Skills Related to CSMP Content
Evaluation Report 1-B-6	Summary Test Data: Detroit Schools
Evaluation Report 1-C-1	Teacher Training Report
Evaluation Report 1-C-2	Observations of CSMP First Grade Classes
Evaluation Report 1-C-3	Mid-Year Data from Teacher Questionnaires
Evaluation Report 1-C-4	End-of-Year Data from Teacher Questionnaires
Evaluation Report 1-C-5	Interviews with CSMP Kindergarten Teachers
Evaluation Report 1-C-6	Analysis of Teacher Logs

Evaluation Report 2-A-1	Final Summary Report Year 2
Evaluation Report 2-B-1	Second Grade Test Data
Evaluation Report 2-B-2	Readministration of First Grade Test Items
Evaluation Report 2-B-3	Student Interviews
Evaluation Report 2-C-1	Teacher Questionnaire Data
Evaluation Report 2-C-2	Teacher Interviews, Second Grade
Evaluation Report 2-C-3	Teacher Interviews, First Grade

Evaluation Report 3-B-1	Second and Third Grade Test Data Year 3
Evaluation Report 3-C-1	Teacher Questionnaire Data Year 3

Evaluation Report 4-A-1	Final Summary Report Year 4
Evaluation Report 4-B-1	Standardized Test Data, Third Grade
Evaluation Report 4-B-2	Mathematics Applied to Novel Situations (MANS) Test Data
Evaluation Report 4-B-3	Individually Administered Problems, Third Grade
Evaluation Report 4-C-1	Teacher Questionnaire Data, Third Grade

Evaluation Report 5-B-1	Fourth Grade MANS Test Data
Evaluation Report 5-B-2	Individually Administered Problems, Fourth Grade
Evaluation Report 5-C-1	Teacher Questionnaire and Interview Data, Fourth Grade

Evaluation Report 6-A-1	Summary of Evaluation Data Through Fourth Grade
Evaluation Report 6-B-1	Comparative Test Data: Fourth Grade
Evaluation Report 6-B-2	Preliminary Test Data: Fifth Grade
Evaluation Report 6-C-1	Teacher Questionnaire Data: Grades 3-5

Key to Indexing

Evaluation Reports are labelled m-X-n,

where m is the year of the pilot study, with 1973-74 as Year 1.
X is the type of data being reported where A is for overviews and summaries, B is for student outcomes and C is for other data.
n is the number within a given year and type of data.

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Summary

At the end of the 1978-79 school year, a series of tests was administered to fourth grade CSMP classes and to comparable non-CSMP classes. There were 30 CSMP classes involved, which constituted about 2/3 of those fourth grade classes who had been using CSMP as their regular curriuclum since at least second grade. There were 21 non-CSMP classes, located in different schools but within the same school districts, who were studying one of five commonly used Mathematics texts as their basis of instruction. Altogether 9 school districts were involved, in various geographic locations and various socio-economic levels.

The tests used to compare the two groups were the Stanford Achievement Computation Test and the MANS tests, a series of 24 short test scales intended to assess, usually through novel situations, some of the underlying mathematical processes of the CSMP program, but without using any of its special terminology or techniques. The Stanford Achievement Reading Comprehension Test was used as a covariate or statistical control for differences in ability between the two groups, which were in any case very small. The median percentile rank on this test was 64 for CSMP classes and 62 for non-CSMP classes.

Class means were calculated for each scale and an Analysis of Covariance procedure, with reading as covariate and class mean as the unit of analysis, was used to compare the two groups of classes. The main results were the following:

1. a) Non-CSMP classes did better, at the .05 level of significance, on one scale: The Stanford Achievement Test (mean score adjusted for reading ability was 25.3 versus 23.3).

   b) CSMP classes did significantly better on the other Computation Scales, Mental Arithmetic and Fractions (combined mean 23.1 versus 19.9). When all Computation Scales were combined there were no significant differences.

2. CSMP classes did significantly better on all 5 scales dealing with Estimation (combined mean 25.6 versus 23.7), all 5 scales dealing with Number Relationships (32.7 versus 23.7), and two of the three scales dealing with Other Number Systems (fractions, decimals and negative numbers, 8.5 versus 6.6). They also did better on one of two Word Problem Scales and on the one Probability Scale.

3. There were no differences on the two Place Value Scales, and the one Geometry Scale.

4. The overall mean on all scales was 145.3 for CSMP versus 127.5 for non-CSMP classes.

These findings are consistent with results from other grade levels, in other years and at other sites, namely that a) CSMP students do better with number relationships, estimation, certain kinds of word problems and fractions/decimals/negative numbers and b) there are no differences in geometry, place value, simple word problems and overall computational skills.

As well as comparing class means, CSMP versus non-CSMP comparisons were made in several other ways. Whether students were grouped according to sex, according to race, or according to reading level, the CSMP-non-CSMP differences were consistent with those obtained from class means, i.e. no interaction effects. When an ANCOVA procedure was used with site rather than class as the unit of analyses, similar results were again obtained, except for one site where there were few observable differences.

Some differences were obtained in CSMP versus non-CSMP teachers' responses to a questionnaire. Most could be attributed to curricular rather than teacher effects, though CSMP classes were generally longer and CSMP teachers enjoyed teaching math more, and these could be interpreted either way. The fact that CSMP and non-CSMP teachers were always located in different schools and that CSMP teachers did not volunteer directly for the program (but rather "inherited" it from third grade classes) argues against a strong teacher effect, i.e. against the hypothesis that teachers rather than curriculum caused the differences.

Given the above, and the known similarities between the CSMP and non-CSMP classes, together with the consistency of these results with previous findings and other methods of analysis, it seems clear that the CSMP curriculum does indeed promote improvement in several important mathematical thinking processes with minimal loss in the usual areas of study. Naturally these findings are generalizable only to the extent that other CSMP implementations take place in a similar fashion to those contained in this study.

Introduction

This report describes the results from the administration of a series of tests to 30 fourth grade classes studying the Comprehensive School Mathematics Program and to 21 comparison fourth grade classes studying more traditional programs. There were four kinds of scales used:

a) A series of attitude measures from the National Assessment of Education-Progress (NAEP).

b) The items from the Stanford Achievement Computation Tests Form A, Level 1.

c) The MANS scales, a series of 24 short test scales intended to assess some of the underlying thinking skills thought to be contained in the CSMP curriculum.

d) The items from the Stanford Achievement Reading Comprehension Test. The scores from this test were used as covariates in the subsequent analysis.

All the tests were administered in the Spring of 1979. No pretest was collected; the design was intended to compare CSMP and non-CSMP classes at the end of four grades rather than just during the fourth grade year.

Previous comparative data have been collected during the past few years at earlier grade levels, and in 1979 as part of a small fifth grade study. Results from those studies, and from other, non-test data, collected during the Extended Pilot Trial of the CSMP curriculum are described in other Evaluation Reports (see page iii).

Setting

Participating Classes

Altogether there were 46 classes studying the regular fourth grade CSMP curriculum, i.e. the program intended for classes which had studied CSMP in previous years. Thirty of these classes participated in the study; for the remaining classes it was not possible to conduct this testing, usually because there were too few classes in the district for the testing (and tester training) to be economically feasible.

Comparison classes were provided as possible by the participating school districts. These classes were selected to be as similar as possible to the CSMP classes. Reading scores indicate that two groups of classes were similar at least in this regard. Data comparing CSMP and non-CSMP teachers is provided later in this section.

Table 1, below lists the various CSMP and non-CSMP classes.

Table 1

Participating CSMP and non-CSMP Fourth Grade Classes

Site Number	Number of CSMP Classes	Number of Non-CSMP Classes	Type of Community	Approximate Socio-Economic Status
1*	6	0	Suburb of Small City	Middle
4**	10	6	Inner Suburban	Middle/Lower Middle
6	2	2	Exurban	Middle/Lower Middle
7	6	6	Suburb of Large City	Upper Middle
8	3	4	Urban	Low/Lower Middle
9	3	3	Small City/ Suburban	Middle
	Total 30	21		

** Site number 4 made up of classes from school districts 2,3,4,and 5 which were similar, located near one another and treated as a single site for the purposes of this study. Otherwise, each "site" is a school district.

* Non-CSMP classes were unavailable in this district because CSMP had been adopted for all classes.

A rough indication of the ability levels of participating classes was obtained by using the norms provided by the Stanford Achievement Reading Test. Table 2 summarizes this data.

Table 2

Percentile Rank Corresponding to Mean Raw Score
Stanford Achievement Test, Reading Comprehension

Site	CSMP Classes	Non-CSMP Classes	Combined
1	78		78
4	60	58	59
6	57	60	58
7	84	83	83
8	47	51	49
9	60	67	63

It can be seen that, with the exception of Sites 1 and 7, the percentile ranks tended to be in the 50-60 range and that the CSMP and non-CSMP classes were fairly well matched. The absence of non-CSMP classes in Site 1 meant that, overall, CSMP classes had slightly higher reading scores. The median percentile rank was 64 for the 650 CSMP students versus 62 for the 475 non-CSMP students.

Random assignment of teachers to CSMP/non-CSMP classes was not possible because the teachers merely taught whichever curriculum was "in place" in their respective schools. For non-CSMP classes this was usually one of 5 or 6 commonly used textbooks;[1] the content covered by these texts is substantially the same.

---

[1] Houghton Mifflin: Mathematics for Individual Achievement and Modern School Mathematics
Scott Foresman: Mathematics Around Us
Addison Wesley: Investigating School Mathematics
Holt: (Unspecified)

Questionnaires completed by the teachers revealed that CSMP and non-CSMP teachers:

a) Had about the same teaching experience

b) Supplemented the program to about the same degree

c) Indicated about equal levels of math anxiety

whereas CSMP teachers, compared to non-CSMP teachers:

a) Devoted a little more time to math class each day

b) Described their classes as:

  i) more oriented toward general progress (versus basic skills)

  ii) a more favorite time of the day

  iii) having a more "fun" (versus "business-like") atmosphere

These differences (and other, more evaluative judgments noted in the fuller description of the questionnaire data, page 45) may reflect differences in the teachers. but more likely are due to the curriculum being used.

The MANS Tests

The MANS Tests (Mathematics Applied to Novel Situations) are short test scales developed especially to assess what are thought to be some of the underlying thinking skills of CSMP. MANS scales of various kinds have been used in the evaluation of CSMP in second through fifth grade.

The scales are administered by trained testers, who follow a standardized script including sample problems for each scale. Then the students do the test items in that scale and the process is repeated for the next scale. The scales do not contain any of the special vocabulary or techniques of the CSMP program and most of them are built around mathematical situations that are unfamiliar to both CSMP and non-CSMP students.

An intensive pilot test and review procedure is used in developing MANS Scales; Evaluation Report 4-B-3 contains a detailed description of this process in an earlier study. Previous scales are often reused and new ones continually added. In the present study there were a total of 24 MANS scales, containing an average of $8\frac{1}{2}$ items and requiring an average of 5 minutes each, though the tests were essentially untimed except for those dealing with estimation. Three testing periods of 50-60 minutes each were required. For the first session students took one of two test booklets; each booklet contained half the items from the Stanford Achievement Computation and Reading Comprehension tests, two of the four Mental Arithmetic scales and one of the two Word Problem scales. For the other two testing sessions, each test booklet was identical.

Appendix A shows the student pages for each scale, together with a summary of the tester directions and a statement of the goal being assessed by the scale.

Comparison of Class Means

This section describes the results based on using class mean scores as units of analysis. Other analyses based on data at the district level and at the student level can be found in the next section and in Appendix B respectively.

For each scale, two mean scores were calculated for each class; the mean score on that scale and the mean score on the Stanford Achievement Reading Test - both scores based on students present for both tests. (These pairs of mean scores are plotted on graphs for CSMP and non-CSMP classes in Appendix B.)

The mean scores were then computed across the 30 CSMP classes and across the 21 non-CSMP classes. An Analysis of Covariance procedure, with reading as covariate, was then used to determine statistical significance (F-test with 1 and 48 degrees of freedom).

Table 3 summarizes the results for all scales, with scales grouped together by categories according to the kind of problem contained the scale. Two kinds of summary statistical data are given. First is given the adjusted mean scores across CSMP and across non-CSMP classes (adjusted for differences in reading ability which, as noted previously, were quite small so that the subsequent adjustments in mean scores were also small). Second is given the p-value of the F-test on these differences, i.e. the probability of obtaining by chance a difference as large as the one observed had there been in fact no "true" differences between the two curriculum groups.

Then on the pages which follow, this information is repeated and an abstract and sample item for each scale has been added. Appendix B provides a great deal more statistical data on each scale, including item analyses, ANCOVA data, reliability, graphs, etc.

Table 3
Summary of Class Means

		Adjusted Means		Level of
		CSMP	Non-CSMP	Significance
Computation:	C1 Stanford Achievement Computation Test	23.3	25.3	(.03)
	C2 Fractions	6.3	5.1	.01
	C3 Mental Arithmetic: Addition	3.7	3.3	.01
	C4 " " Subtraction	3.0	2.7	.03
	C5 " " Multiplication	5.1	4.7	.07
	C6 " " Division	5.0	4.1	.01
	Total	46.3	45.2	.38
Estimation:	E1 2, 5 or 10	8.3	7.9	.02
	E2 Estimating Intervals: Addition	6.1	5.8	.03
	E3 " " Multiplication	4.8	4.3	.01
	E4 " " Division	3.6	3.2	.01
	E5 Word Problem Approximations	2.8	2.6	.03
	Total	25.6	23.7	.01
Geometry:	G1 Geometric Congruencies	4.7	4.5	.13
Other Number Systems:	N1 Decimal Gas	3.2	2.1	.01
	N2 Negative Hits and Misses	3.0	2.5	.01
	N3 Measuring Fractional Inches	2.3	2.0	.06
	Total	8.5	6.6	.01
Probability:	P1 Spinners	6.9	5.6	.01
Number Relations:	R1 Solving Number Machines	6.2	5.3	.01
	R2 Using Number Machines	6.7	4.6	.01
	R3 Boses, Counting By	7.6	7.2	.01
	R4 Boxes, Multiplying By	7.9	4.1	.01
	R5 Labelling Number LInes	3.8	2.4	.01
	Total	32.2	23.7	.01
Place Value:	V1 Arrowed Number Lines	4.2	4.2	.79
	V2 Constructing Numbers	6.8	6.6	.38
	Total	10.9	10.9	.77
Word Problems	W1 Extraneous Data	5.3	4.9	.08
	W2 Two Stage Word Problems	3.9	3.4	.01
	Total	9.2	8.4	.01

There appear to be virtually no differences between the groups in the total score for Computation, Geometry and Place Value. However, this total score on Computation scales obscures an important finding: non-CSMP classes did significantly better on the Stanford Achievement Computation Test while CSMP classes did significantly better on the Fraction and Mental Arithmetic scales. Further, it can be seen from the item analysis data in Appendix B that even within a single operation, say division, it was also true that non-CSMP classes did better on the one and CSMP classes on the other.

On the other categories; Estimation, Other Number Systems, Probability, Number Relationships and Word Problems, CSMP classes did better than non-CSMP classes at the .01 level of significance.

The adjusted mean scores for the total of all scales were:

CSMP classes: 145.3 (significant at .01)
non-CSMP classes: 127.5

On the following pages, adjusted means and p-values are again given, but an abstract and sample item has been added for each scale. The pages for each category are shown below.

Computation (C): page 12
Estimation (E): page 13
Geometry (G): page 14
Other Number Systems (N): page 14
Number Relationships (R): page 15
Probability (P): page 16
Place Value (V): page 16
Word Problems (W): page 17

SCALE CATEGORY: COMPUTATION

	Adjusted Means		Significance (p-value
	CSMP	Non-CSMP	
(C1) Stanford Achievement Test: Computation (Students took one of two 20-item forms) Abstract: 40 multiple choice questions of two different types: (a) standard computation, 22 items; (b) paired comparison of two computations, 18 items. With each type, items involved each of the four operations and at least 90% involved only whole numbers. Sample: a) 532 × 32 f 16,924 g 2660 h 17,024 j 17,004 k NH b) 54 + 9 ● 48 + 6 > = <	23.3	25.3	.03
(C2) Fractions (Students took one of two 6 item forms.) Abstract: 12 items, with 6 of each type, identical to those in C1 except that 8 involved fractions and 4 involved large number multiplication and division. Sample: a) 6,000 ÷ 78 ● 6,000 ÷ 79 > = < b) $\frac{3}{5} - \frac{1}{5} =$ a $\frac{2}{5}$ b $\frac{4}{5}$ c $\frac{2}{10}$ d $\frac{2}{0}$ e NH	6.3	5.1	.01
(C3) Mental Arithmetic: Addition (Students took either C3 + C6 or C4 + C5) Abstract: An open number sentence involving addition must be completed without aid of pencil and paper, 5 items. Sample: 53 + 8 = ☐	3.7	3.3	.01
(C4) Mental Arithmeitc: Subtraction Abstract: Same as C3, but with subtraction, 5 items Sample: 72 − 4 = ☐	3.0	2.7	.03
(C5) Mental Arithmetic: Multiplication Abstract: Same as C3, but with multiplication, 8 [illegible] Sample: ☐ x 4 = 400	5.1	4.7	.07
(C6) Mental Arithmetic: Division Abstract: Same as C3, but with division, 8 items Sample: 150 DIVIDED BY 25 = ☐	5.0	4.1	.01
Total: Computation Scales	46.3	45.2	.38

SCALE CATEGORY: ESTIMATION

		Adjusted Means		Significance (p-value)
		CSMP	Non-CSMP	
(E1)	2, 5 or 10 Abstract: Quickly estimate whether a given number is about 2 or 5 or 10 times as large as another given number, 13 items. Sample: 100 is about _____ times as large as 19	8.3	7.9	.02
(E2)	Estimating Intervals: Addition Abstract: Quickly estimate which of 5 intervals contains the answer to a series of computation problems, 8 items. Sample: 479 + 86 0 10 50 100 500 1000	6.1	5.8	.03
(E3)	Estimating Intervals: Multiplication Abstract: Same as E2, except multiplication, 8 items. Sample: 40 x 10 0 10 50 100 500 1000	4.8	4.3	.01
(E4)	Estimating Intervals: Division Abstract: Same as E2, except division, and only 4 intervals, 8 items. Sample: 101 DIVIDED BY 9 0 1 10 20 100	3.6	3.2	.01
(E5)	Word Problem Approximations Abstract: Quickly choose one of 4 round-number answers as closest to the exact answer to a word problem with relatively easy calculations, 6 items Sample: Susan has $131. Chairs cost $32. About how many chairs can Susan buy? 2 chairs 4 chairs 6 chairs 10 chairs	2.8	2.6	.03
	Total: Estimation Scales	25.6	23.7	.01

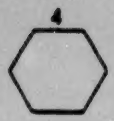
SCALE CATEGORY: GEOMETRY

	Adjusted Means		Significance
	CSMP	Non-CSMP	(p-value)
(G1) Geometric Congruencies	4.7	4.5	.13

(G1) Geometric Congruencies

Abstract: After examining 3 correct and 3 incorrect solutions to a sample problem, given a regular geometric shape and a number of parts, the shape must be divided into that many congruent parts, 8 items. The word "congruent" was not used.

Sample:



SCALE CATEGORY: OTHER NUMBER SYSTEMS

	CSMP	Non-CSMP	Significance (p-value)
(N1) Decimal Gas	3.2	2.1	.01
(N2) Negative Hits and Misses	3.0	2.5	.01
(N3) Measuring Fractional Inches	2.3	2.0	.06
Total: Other Number Systems Scales	8.5	6.6	.01

(N1) Decimal Gas

Abstract: With word problems about gasoline, one step solutions are required in which the numbers involve decimals, 7 items.

Sample:

Tom has 6.5 gallons.
He buys 3.5 more gallons.
How much gas will he have then? ____________

(N2) Negative Hits and Misses

Abstract: Given two rules [(a) each hit means a gain of 5 points (b) each miss means a loss of 1 point] and given a vertical number line running from 12 below zero to 15 above, players turns are described in part with the required task being to to complete the description, 6 items.

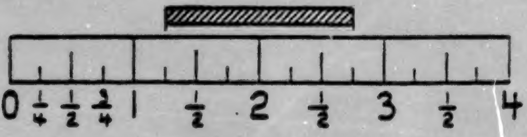
Sample:

	Started with a score of	Number of Hits	Number of Misses	Ended with a score of
Peter	10 below zero	1		12 below zero

(N3) Measuring Fractional Inches

Abstract: Calculate the length of a given bar laid along a ruler marked in 1/2, 1/4 or 1/10 inches, 6 items.

Sample:



____

Total: Other Number Systems Scales 8.5 6.6 .01

SCALE CATEGORY: NUMBER RELATIONS

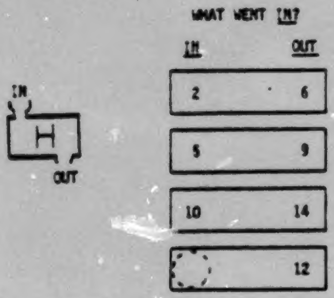
Adjusted Means CSMP Non-CSMP | Significance (p-value)

(R1) Solving Number Machines

Abstract: From 3 pairs of numbers, determine what the machine is doing to produce the second number from the first and use this knowledge to find the missing number from the 4th pair, 8 items.

6.2 5.3 .01

Sample:

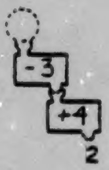


(R2) Using Number Machines (only done by students previously doing R1)

Abstract: Given a number of labelled machines in sequence, find the initial or the terminating number, given the other, 10 items.

6.7 4.6 .01

Sample:

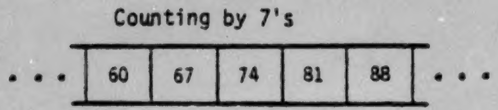


(R3) Boxes: Counting by

Abstract: Presented with an infinite series of boxes each of which contains a member of an additive series of numbers, questions are asked about the series' membership of other numbers, 4 different series, 12 questions (3 on each one series).

7.6 7.2 .01

Sample:



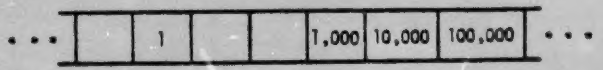
Will 46 be in any of the boxes? ______

(R4) Boxes: Multiplying By

Abstract: Same idea and format as in R3 except that the series is multiplicative and specific empty boxes are to be filled in, 5 series, 13 items (empty boxes).

7.9 4.1 .01

Sample:

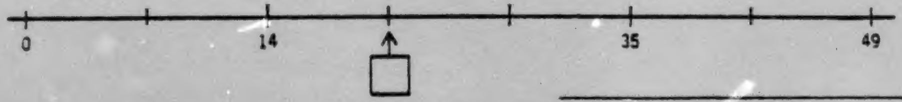


(R5) Labelling Number Lines

Abstract: Same basic idea as R4 only with an additive series in number line context, 6 number lines, 6 items.

3.8 2.4 .01

Sample:



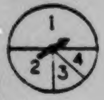
Total: Number Relations Scales 32.2 23.7 .01

SCALE CATEGORY: PROBABILITY

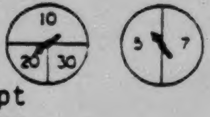
	Adjusted Means CSMP	Adjusted Means Non-CSMP	Significance (p-value)
(P1) Spinners	6.9	5.6	.01

(P1) Spinners

Abstract: On page one, one spinner is shown, and one imagines it being spun 100 times. Then a series of five questions are asked: "about how many times would we get a score of _______?"



On page two, two spinners are shown, with a similar circumstance imagined and a similar 5 questions asked except that the score of the two spinners are to be added. Maximum score is 19 due to credit for relatively correct answers.



Sample: (Page 1)
SUPPOSE WE PLAY THE GAME 100 TIMES
About how many times would we get a score of less than 4? ______________

Sample: (Page 2)
SUPPOSE WE PLAY THE GAME 100 TIMES
About how many times would we get a score of 25? ____________

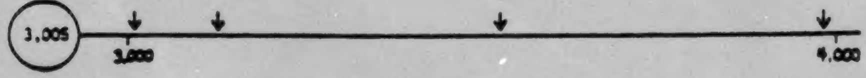
SCALE CATEGORY: PLACE VALUE

	Adjusted Means CSMP	Adjusted Means Non-CSMP	Significance (p-value)
(V1) Arrowed Number Lines	4.2	4.2	.79
(V2) Constructing Numbers	6.8	6.6	.38
Total. Place Value Scales	10.9	10.9	.77

(V1) Arrowed Number Lines

Abstract: Given a segment of a number line with four little arrows pointing to four different points, circle the arrow pointing closest to a given number, 12 items.

Sample:



(V2) Constructing Numbers

Abstract: Given four different digits, and examples of legal and illegal 2, 3 and 4 digit numbers, construct a two, three or four digit number. The constructed number is either the largest, the smallest or the closest to a given number, 10 items.

Sample: Which three-digit number is closest to 600? _ _ _

SCALE CATEGORY: WORD PROBLEMS (also see E5 and N1)

	Adjusted Means		Significance (p-value)
	CSMP	Non-CSMP	
(W1) Extraneous Data (Students took either W1 or W2)	5.3	4.9	.08

Abstract: Student must read a 4 or 5 sentence word problem, disregard one or two pieces of extraneous information and then complete the one step solution involving small whole numbers, 7 items.

Sample:

Yesterday Ann bought 3 books.
Books cost 20¢ each.
Ann has 30¢ left.
She wants to buy a game that costs 45¢.
How much more money does she need to buy the game? ______________

(W2) Two-Stage	3.9	3.4	.01

Abstract: Student must read a 2 to 4 sentence word problem and complete a solution involving two different operations, 7 items.

Sample:

Pam gets 50¢ each week.
She always spends 30¢ and saves the rest.
How much will she save in 4 weeks? ________________

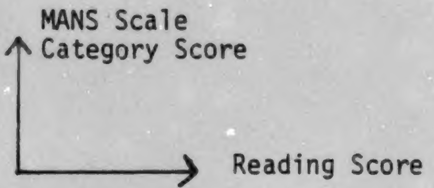
Total: Word Problem Scales	9.2	8.4	.01

Other Findings

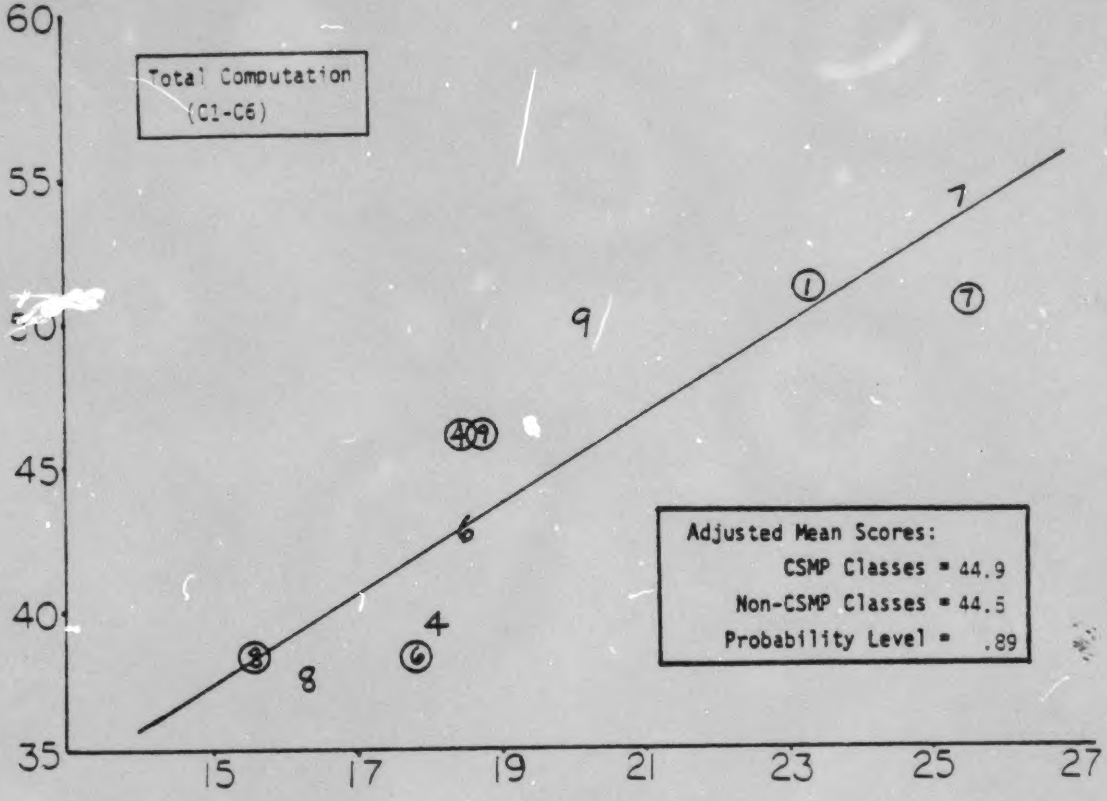
MANS Scores by District Means

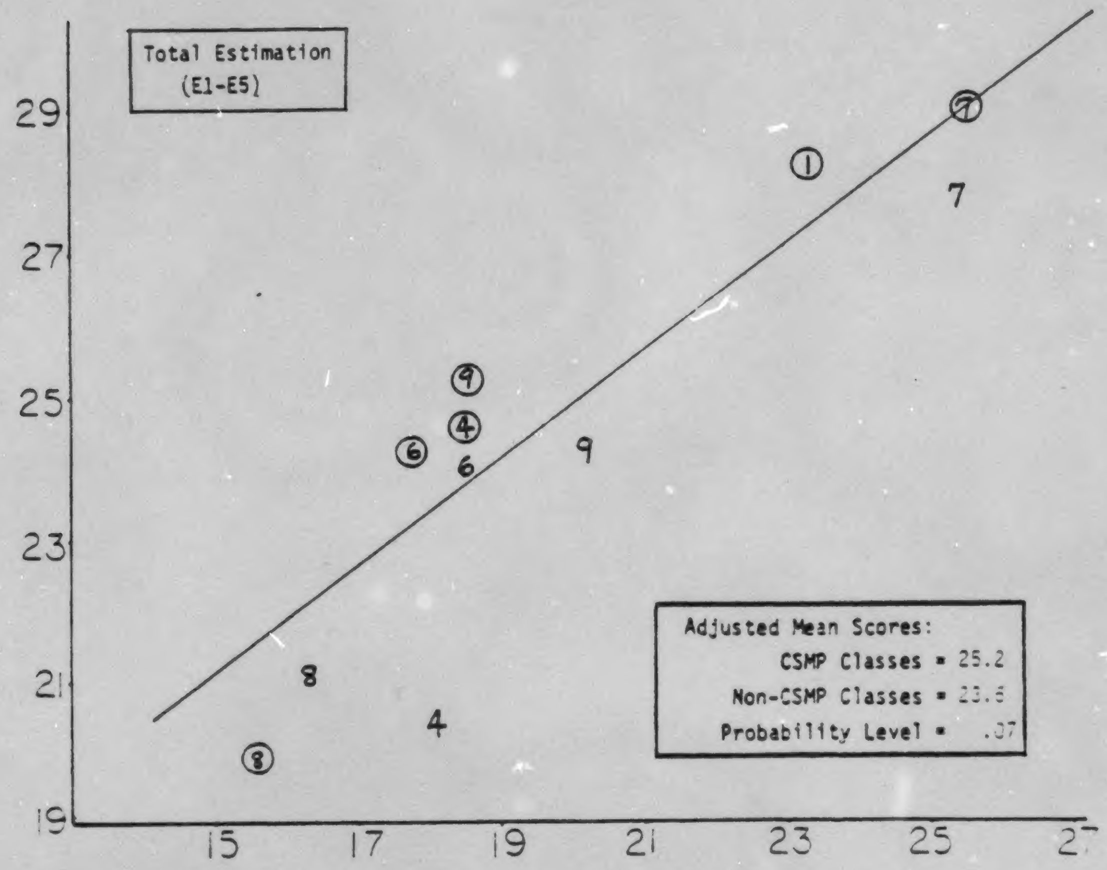
For each scale category, (i.e. the total score from the scales within the category), a similar analysis of covariance procedure was used to compare school district means. At each site, the class mean scores were averaged separately for CSMP and non-CSMP classes. Thus the data for each category consisted of pairs of means - scale category score and reading score - for 6 CSMP and 5 non-CSMP districts (Site 1 had no non-CSMP classes).

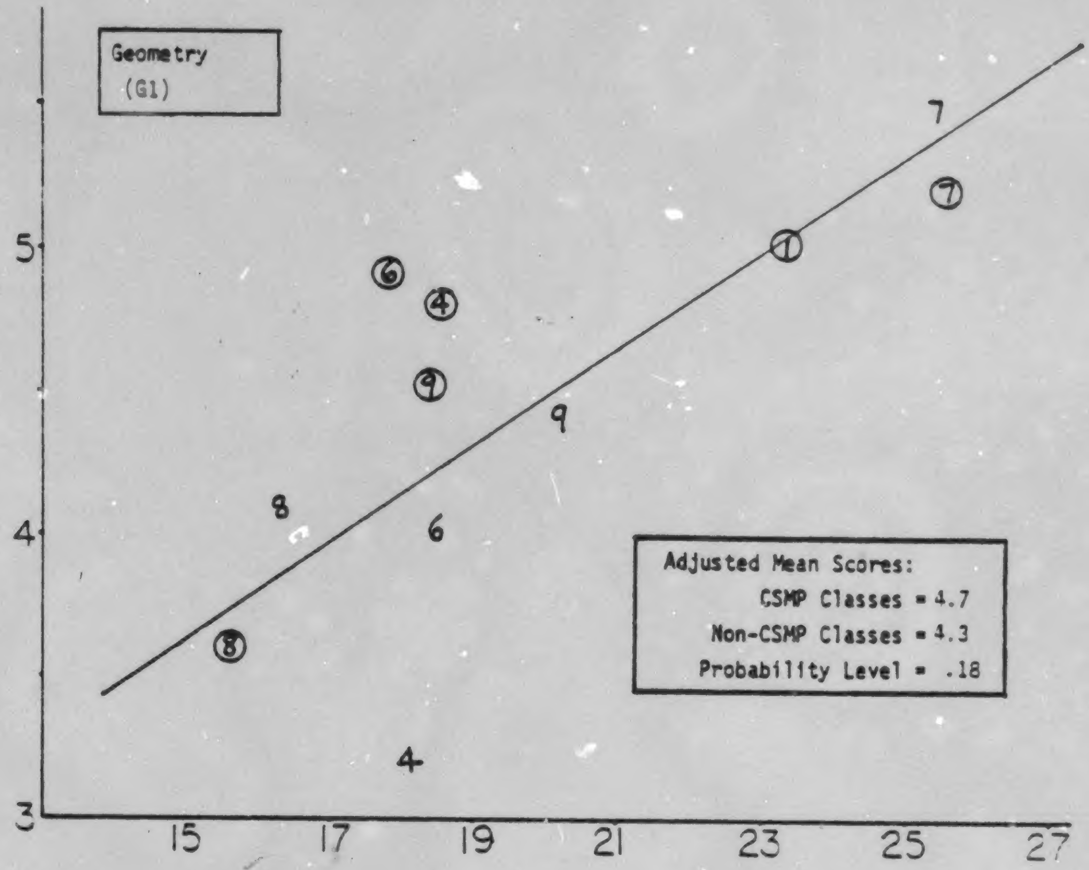
These means are plotted on the following pages as follows:

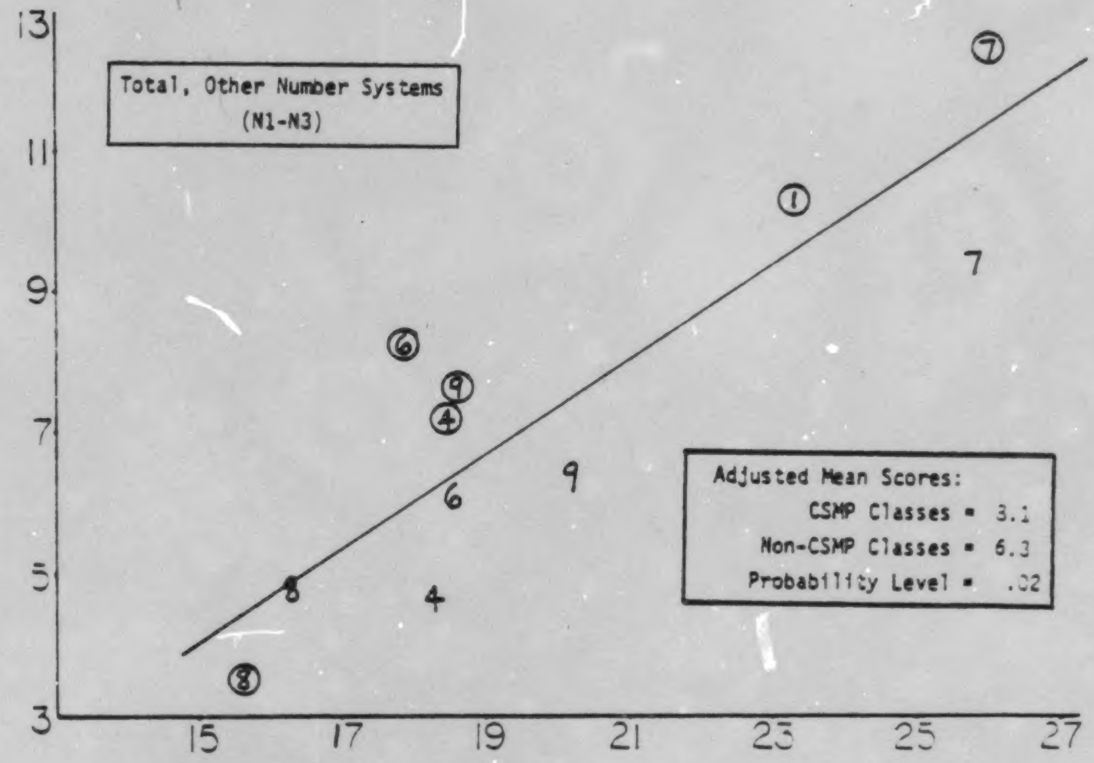


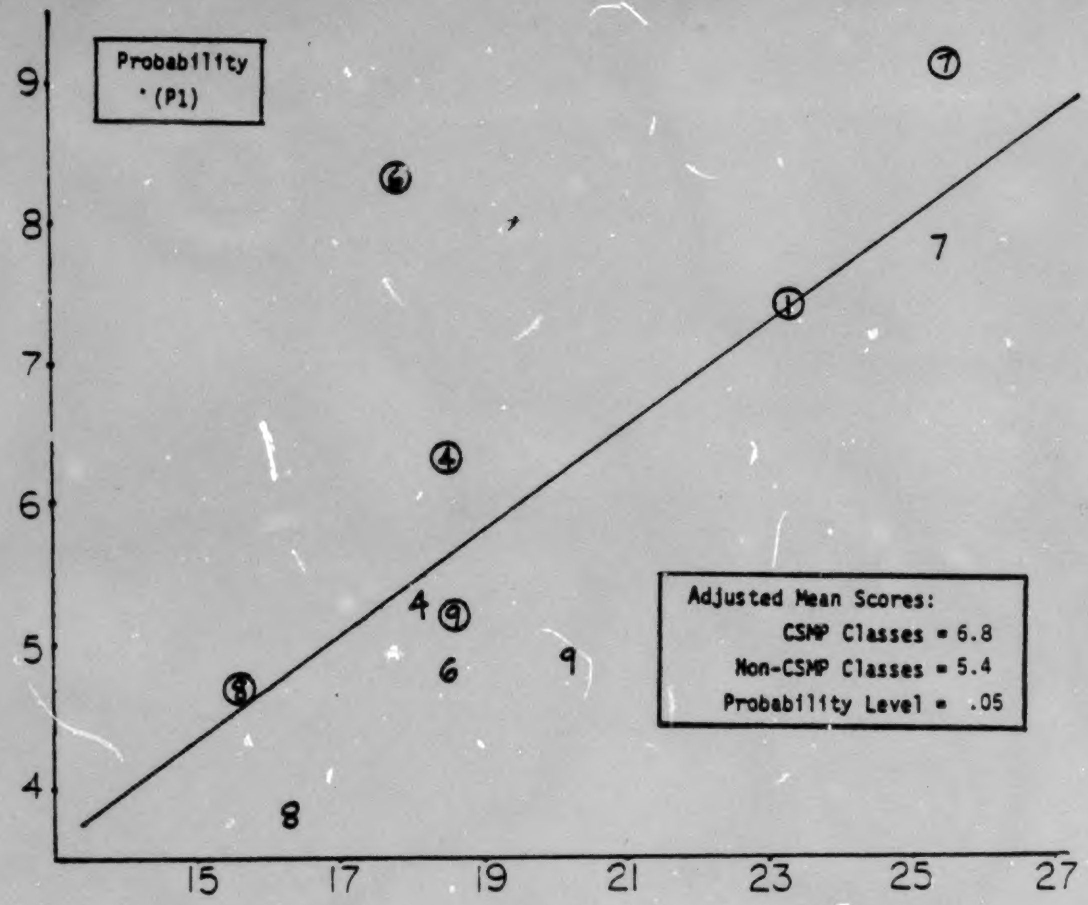
The entries on the graph are numerals corresponding to sites as given in Table 1, page 3. A circled numeral is for the average of the CSMP class means in that site, a plain numeral for the non-CSMP classes. The regression line which has been drawn is the best linear predictor of category score given reading score. Also given are the adjusted CSMP and non-CSMP means, and the level of significance, using the ANCOVA procedure (1 and 8 degrees of freedom).

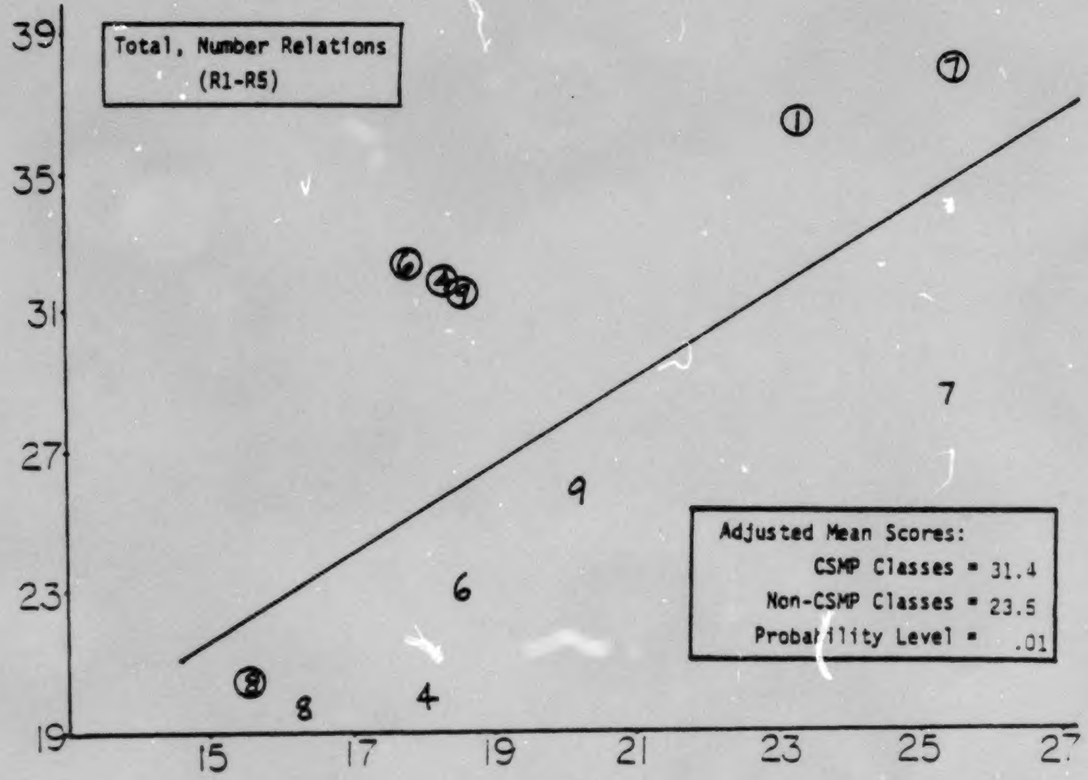

Total Computation
(C1-C6)
Adjusted Mean Scores:
CSMP Classes = 44.9
Non-CSMP Classes = 44.5
Probability Level = .89
60
55
50
45
40
35
15
17
19
21
23
25
27
7
①
⑦
9
④
⑨
6
4
⑧
⑥
8

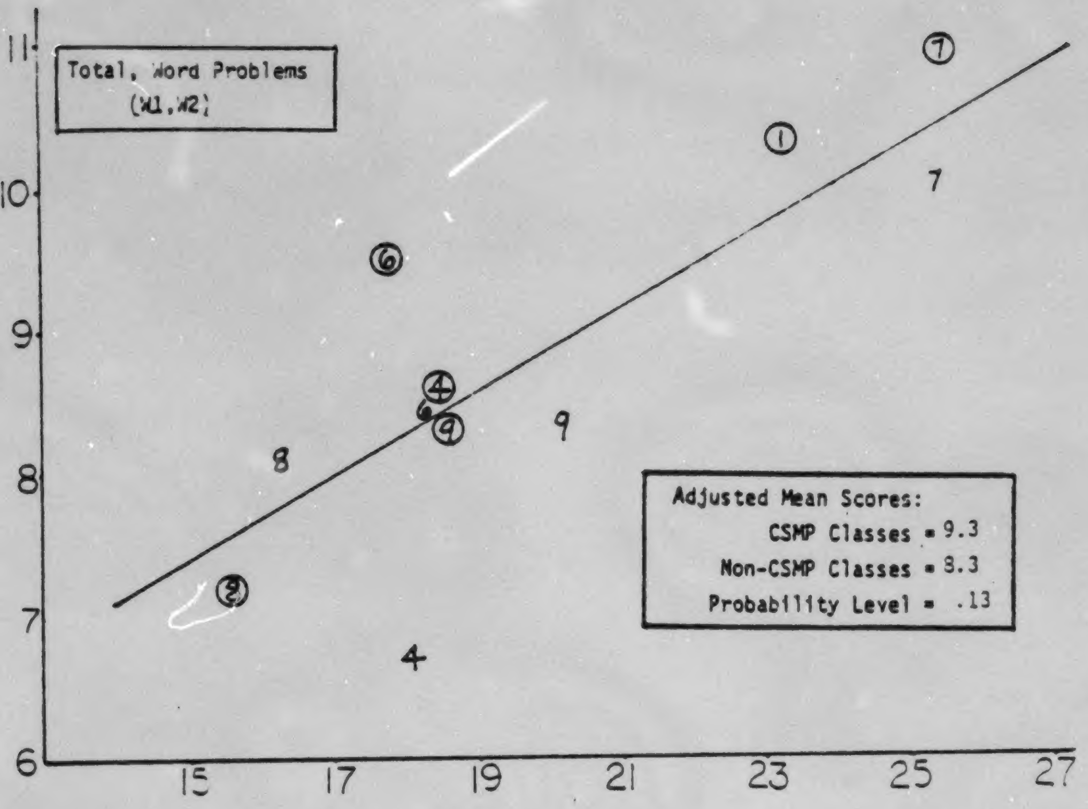

Total Estimation
(E1-E5)
Adjusted Mean Scores:
CSMP Classes = 25.2
Non-CSMP Classes = 23.6
Probability Level = .07
29
27
25
23
21
19
15
17
19
21
23
25
27
⑦
①
7
⑨
④
⑥
6
9
8
4
⑧

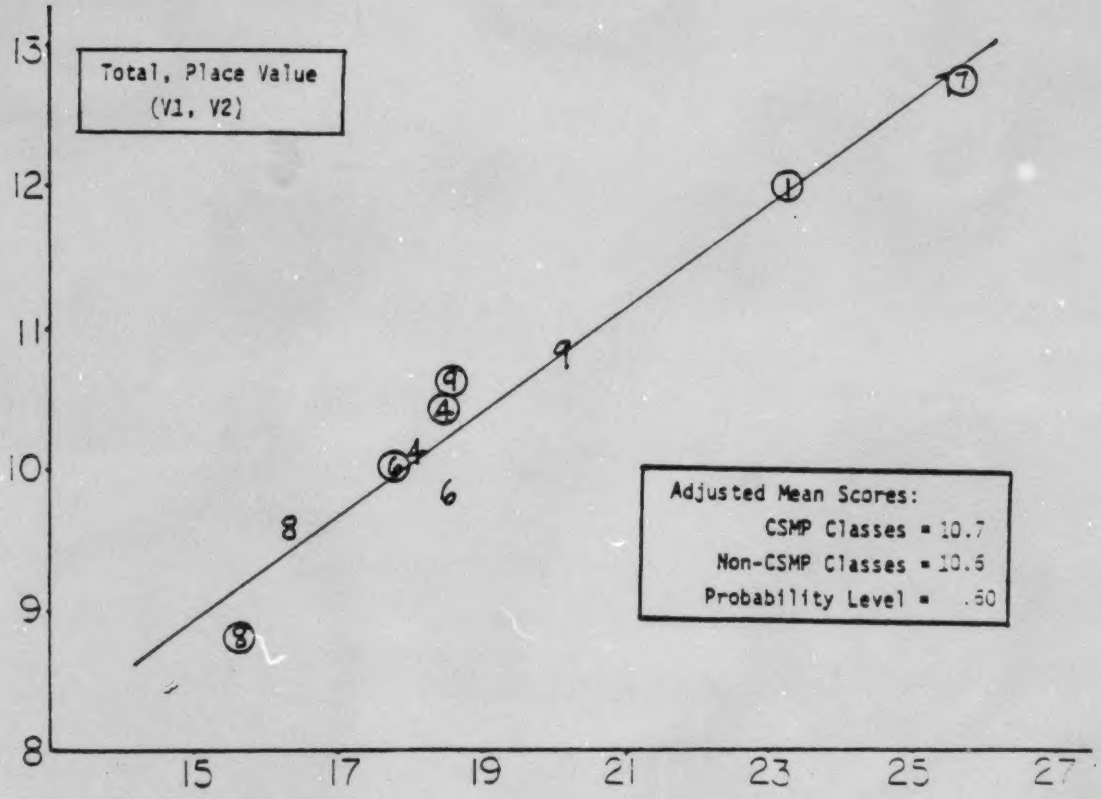

Geometry
(G1)
Adjusted Mean Scores:
CSMP Classes = 4.7
Non-CSMP Classes = 4.3
Probability Level = .18
3
4
5
15
17
19
21
23
25
27
⑥
④
⑨
①
⑦
⑧
7
9
8
6
4

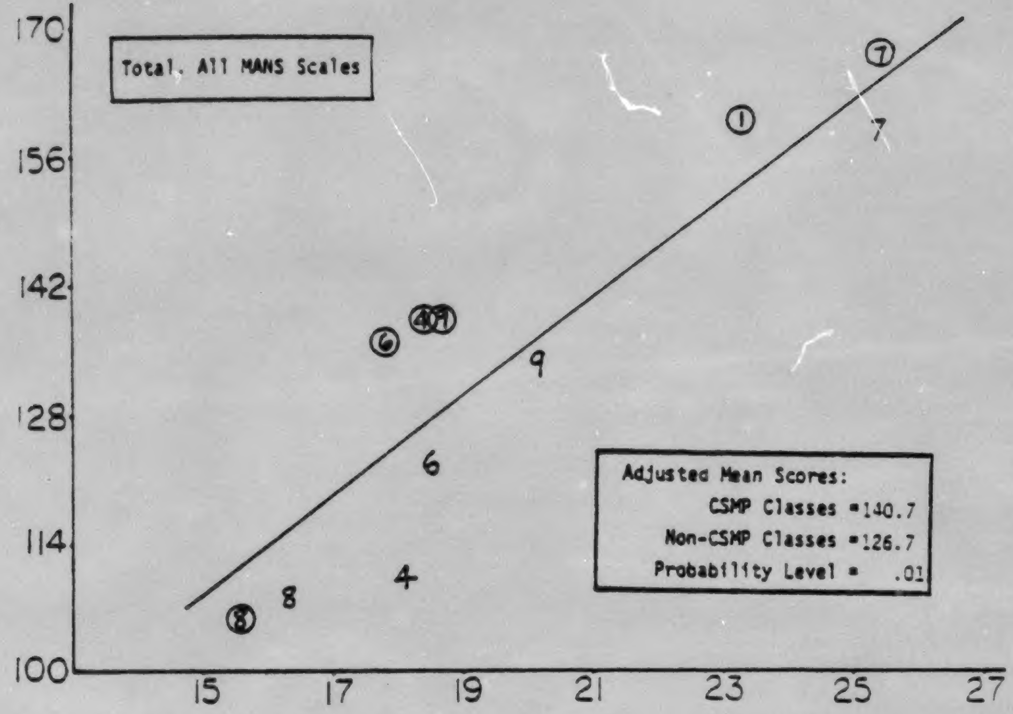

Total, Other Number Systems
(N1-N3)
Adjusted Mean Scores:
CSMP Classes = 8.1
Non-CSMP Classes = 6.3
Probability Level = .02
3
5
7
9
11
13
15
17
19
21
23
25
27
⑦
①
⑥
⑨
④
⑧
7
9
6
8
4


Probability
(P1)
⑦
⑥
7
①
④
4
⑨
6
9
⑧
8
Adjusted Mean Scores:
CSMP Classes = 6.8
Non-CSMP Classes = 5.4
Probability Level = .05
9
8
7
6
5
4
15
17
19
21
23
25
27


Total, Number Relations
(R1-R5)
⑦
①
⑥
④
⑨
7
9
6
⑧
8
4
Adjusted Mean Scores:
CSMP Classes = 31.4
Non-CSMP Classes = 23.5
Probability Level = .01
39
35
31
27
23
19
15
17
19
21
23
25
27


Total, Word Problems
(W1, W2)
Adjusted Mean Scores:
CSMP Classes = 9.3
Non-CSMP Classes = 8.3
Probability Level = .13
11
10
9
8
7
6
15
17
19
21
23
25
27
⑦
①
7
⑥
④
6
⑨
9
8
⑧
4


Total, Place Value
(V1, V2)
Adjusted Mean Scores:
CSMP Classes = 10.7
Non-CSMP Classes = 10.6
Probability Level = .60
13
12
11
10
9
8
15
17
19
21
23
25
27
⑦
①
9
⑨
④
4
⑥
6
8
⑧



The results obtained from district-level analysis agree substantially with those from class-level analysis except that the level of significance is lower with the district-level analysis reflecting the much smaller number of cases:

a) Dramatic and visually apparent differences in favor of CSMP on Number Relationships (R) and Other Number Systems (N).

b) Smaller and nearly significant differences in favor of CSMP on Word Problems (W), Estimation (E), Geometry (G) and Probability (P).

c) Virtually no differences in Computation (C) and Place Value (V).

The results were fairly consistent from site-to-site with one exception; in Site 8 there were very few differences between the CSMP and non-CSMP classes (see for example the last graph, of Total MANS scores). In this site, the non-CSMP classes are generally performed at about the level of other non-CSMP districts when reading score is taken into consideration. CSMP classes, however, scored at a lower level than other CSMP districts. Unfortunately, very little is known about the details of CSMP implementation in these particular classes, though it is known that the teachers concerned received less training than did CSMP teachers in the other participating districts.

MANS Scores by Reading Level of Student

Students were assigned to quintiles according to the percentile rank from the published norms corresponding to their scores on the Stanford Achievement Reading Test. Q1 is for all students scoring below the 20th percentile, Q2 for 20-39th, Q3 for 40-59th, Q4 for 60-79th and Q5 for the 80th percentile or higher. Then MANS scores were analyzed separately for each quintile of students.

The mean reading score for each quintile and the number and percent of students in each quintile is shown below in Table 4.

Table 4
Number and Percent of Students
in Each Quintile

	Mean Reading Score		Number of Students		Percent	
	CSMP	Non-CSMP	CSMP	Non-CSMP	CSMP	Non-CSMP
Q1	8.3	7.6	55	51	9	11
Q2	12.4	12.4	91	69	14	15
Q3	16.3	16.2	137	95	21	20
Q4	21.4	21.6	166	116	26	25
Q5	29.2	28.8	195	141	30	30
			644	472		

The table reflects the fact that this group of about 1100 students was above average, the median percentile rank being about 63. The percent of students in each quintile is similar for CSMP and non-CSMP as are the mean reading scores, except that CSMP students in Q1 had slightly higher scores. The means for the quintiles correspond very closely to percentile ranks of 10, 30, 50, 70 and 90 respectively.

For each quintile, mean scores on each MANS scale were derived across all students in that quintile. This was done separately for CSMP and non-CSMP students. Figure 1 shows a graph of mean scores by quintile on the total of all the MANS scales.

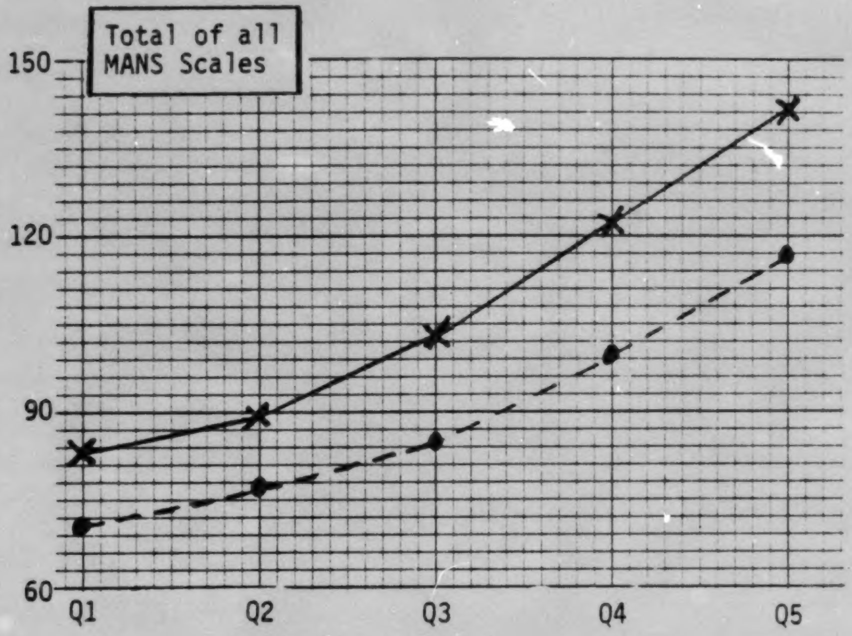


Figure 1, Total MANS Score by Quintile

x———x: CSMP

● ----●: Non-CSMP

It can be seen that CSMP students had much higher scores than non-CSMP students and the difference was consistent across the various reading levels.

Figure 2 shows a similar graph of mean scores by quintiles on the total of the Computation scores.

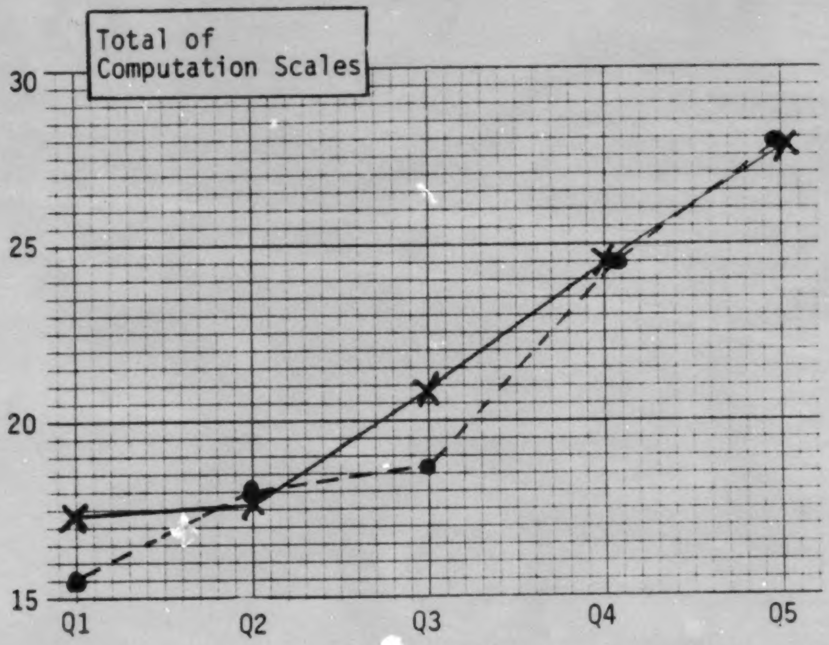


Figure 2, Total Computation Score by Quintile

x———x: CSMP

•– – –•: Non-CSMP

Figure 2 shows that there are virtually no CSMP differences except at Q1 and Q3 where CSMP students were slightly better. However, if Total Computation is broken up into its three components; Stanford Computation Test, Mental Arithmetic, and Fractions; the reasons for this finding become clearer. This is done in Figure 3.

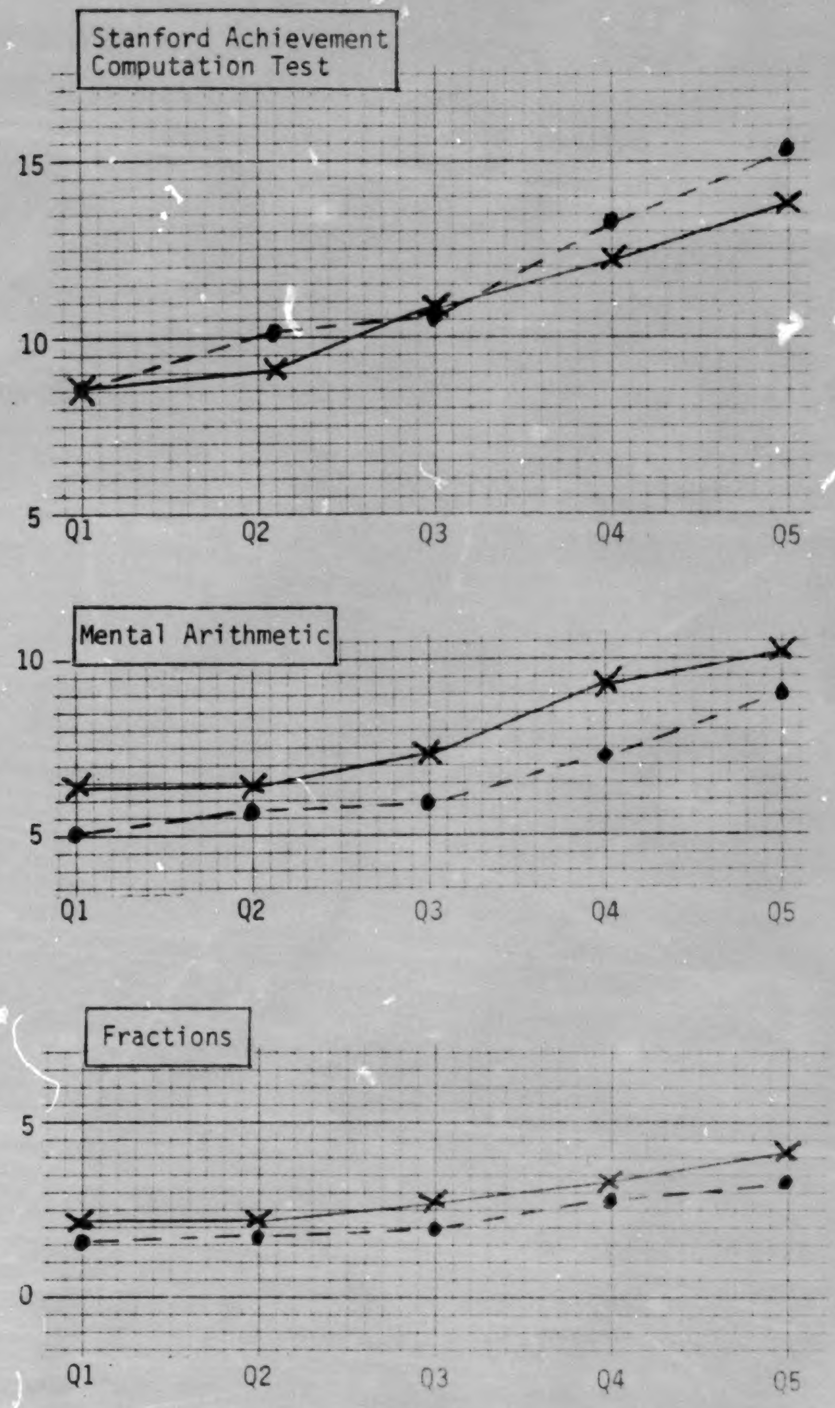


Figure 3, Scores of Various Computation Components by Quintile

X———X: CSMP, •- - - -•: Non-CSMP

At Q2, Q4 and Q5, CSMP students do better on Mental Arithmetic and Fractions but non-CSMP students do better on the Stanford Achievement Computation Test and these differences balance almost exactly. At Q1 and Q3 , CSMP students again do better on Mental Arithmetic and Fractions, but there are no differences on the Stanford Computation; hence the slight CSMP advantage on Total of the Computation Scales.

Figure 4 shows similar graphs for the totals of the Estimation, Number Relationships and Other Number Systems scales. There is a clear advantage for CSMP students on each of these categories and in each case the differences are consistent across quintiles.

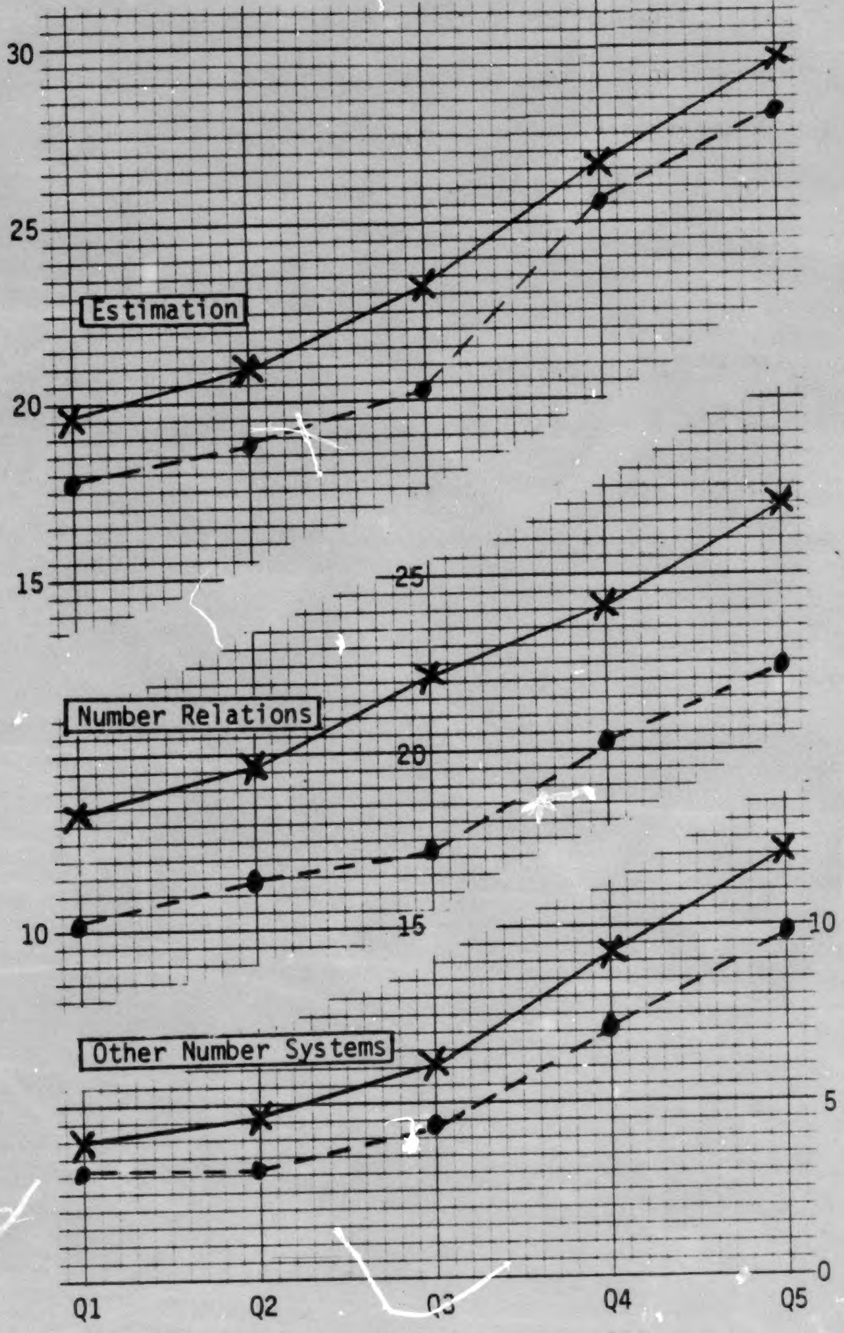


Figure 4, Total of Category Scores by Quintile

X————X; CSMP •- - - - - -•:Non-CSMP

Figure 5 shows the graph for the Place Value and Word Problem categories, each of which consisted of 2 scales. There was virtually no difference on the Place Value scores and a small but consistent difference in favor of CSMP on the Word Problem scales.

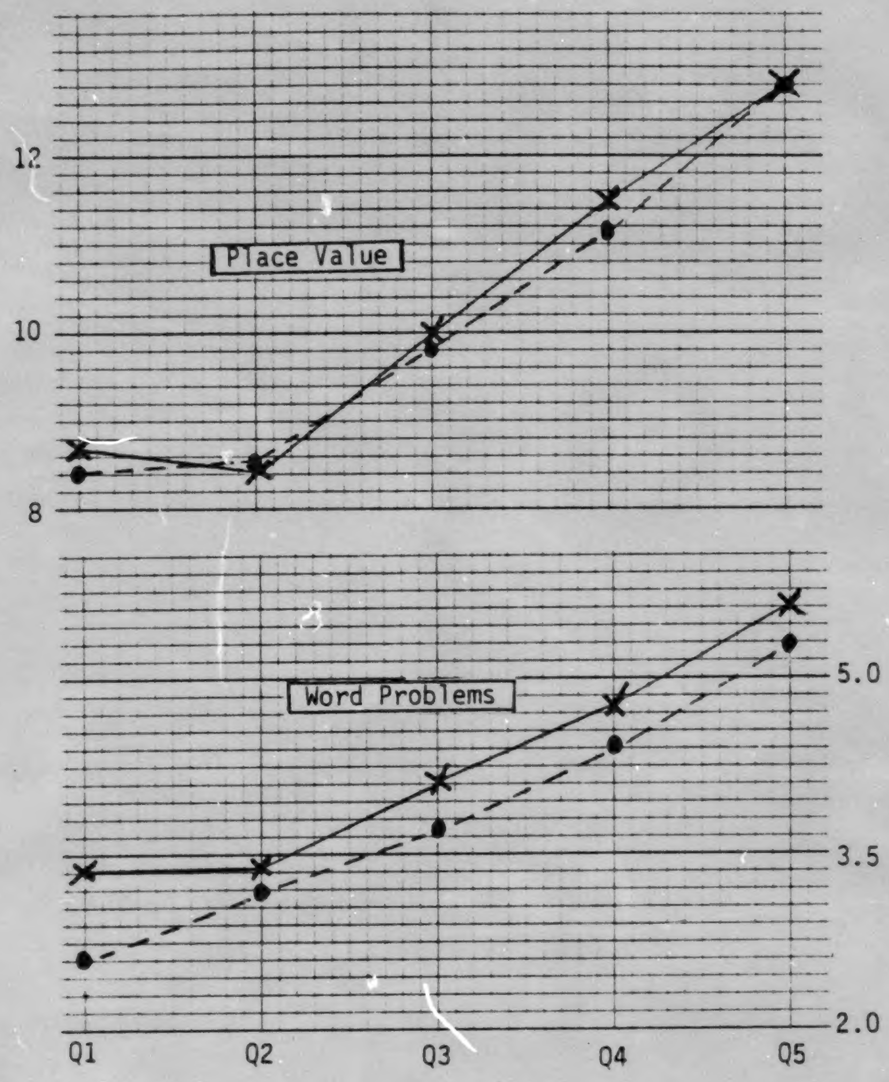


Figure 5, Total of Category Scores by Quintile

X————X : CSMP, ●- - - - - -● : Non-CSMP

Previous CSMP-Non-CSMP Comparisons

Similar MANS testing has been carried out in third grade (1977, see Evaluation Report 4-B-2) and at fourth and fifth grades on a pilot basis with smaller numbers of classes (1978, Report 5-B-1 and 1979, Report 6-B-2 respectively).

Generally the data is very consistent with these other comparisons:

a) CSMP students have performed much better on scales assessing abilities in mental arithmetic, number relationships, estimation and other number systems (fractions, decimals, negative numbers).

b) There has typically been no difference on word problems of the straightforward one-stage vareity but on other, more sophisticated types of word problems, CSMP students have done better.

c) There have been no differences on place value scales.

d) On straightforward whole number computation the results have been mixed: by far the most usual result has been no significant differences. In third grade CSMP students did better in addition, Non-CSMP in division, but no overall differences. In fourth grade there were no differences in 1978 and a significant difference in favor of non-CSMP in 1979 (the present study). In fifth grade there were no significant differences.

e) In geometry and probability, only a few scales have been used, the most common result being a non-significant difference in favor of CSMP.

3,

MANS Scores by Race and Sex of Student

CSMP-non-CSMP differences in mean scores were also calculated when students were grouped by race and by sex. Table 5 summarizes this data using the t-statistic, which is the difference in means (CSMP minus non-CSMP) divided by the pooled standard deviation of the means. As a rule of thumb, a t-statistic larger than 2.0 may be regarded as significant at the .05 level and larger than 2.5 significant at the .01 level. This is a fairly liberal test of significance, since the unit of analysis is at the student level.

Table 5
Mean Score CSMP Minus Mean Score Non-CSMP
t-statistic of Difference, By Race and Sex

Scale Category	Boys	Girls	White	Black
Computation	0.8	1.8	0.6	2.9
Estimation	2.4	4.6	3.3	3.9
Other Number Systems	4.5	6.5	7.1	3.3
Number Relations	>10	>10	>10	7.4
Place Value	0.3	1.1	1.0	0.4
Word Problems	2.3	2.3	2.5	2.8
Total of all Scales	5.6	7.4	7.6	5.2

The data are consistent regardless of which grouping is used to make CSMP-non-CSMP comparisons: large and significant differences for Estimation, Other Number Systems, and Number Relations; marginally significant differences on Word Problems; no significant differences on Computation and Place Value. The one exception is for Black students, where CSMP students had significantly higher Computation scores than non-CSMP students.

It is worth noting that the MANS tests again produced many sex differences independently of which curriculum was being used and these are summarized in Table 6, below.

Table 6
Sex Differences by Scale Category

	Mean Score		t-test
	Boys	Girls	
Virtually no difference:			
Stanford Achievement, Reading	20.0	20.1	—
Stanford Achievement, Computation	12.1	12.0	—
Geometry	4.5	4.7	—
Marginally in favor of boys:			
Mental Arithmetic (4 scales)	16.6	15.1	3.7
Probability (1 scale)	6.6	5.9	2.6
Number Relations (5 scales)	29.2	27.8	2.2
Word Problems (2 scales)	9.1	8.5	2.1
Greatly in favor of boys:			
Other Number Systems (3 scales)	8.5	6.7	5.5
Estimation (5 scales)	26.1	23.3	6.4

The results show the usual finding of very little difference between boys and girls on standardized measures. However, as with previous findings extending back to second grade, boys do better than girls on MANS scales, with very large differences in some cases. This result is different from the findings prevalent in the literature, namely that these differences do not begin to occur until eighth or ninth grade.

The pattern of results within categories is very consistent. The four entries that were marginally in favor of boys contained 12 scales altogether; the t-test statistics ranged from 1.2 to 2.6 (except for two Mental Arithmetic Scales which were 3.1). The two entries that were greatly in favor of boys contained 8 scales altogether; the t-test statistic was greater than 4.0 for every scale. The exception to this consistency was Place Value (not shown): boys did much better on V1, and there was no difference on V2.

Computation Items

Copyright restriction for the Stanford Achievement Computation Test prevent the listing of items and percentages correct, as is done in Appendix B for the other test scales. However it is possible to present data by item type. Because the result on this particular scale is negative towards CSMP, and because it is an unusual finding which did not occur in third or fifth grade, this analysis is presented in this section rather than relegated to an Appendix.

This test consists of two types of items. One type is straightforward computation of whole numbers, in multiple-choice format, which is labelled here as "Algorithm Type". The other, labelled "Comparison Type", requires the student to select the sign ($<$, $=$ or $>$) that should be placed between two expressions such as 7 x 7 ● 8 x 6.

Table 7 presents summary data by item type. (Three miscellaneous items are not included.)

Table 7

Mean Percent Correct by Item Types
Stanford Achievement Computation Test

	Algorithm Type			Comparison Type		
	Number of Items	Percent Correct		Number Of Items	Percent Correct	
		CSMP	Non-CSMP		CSMP	Non-CSMP
Addition	5	73	71	2	74	78
Subtraction	4	53	54	2	75	80
Multiplication	6*	53	60	3	64	70
Division	6**	52	55	4	48	57
Parentheses (Usually 2 operations)	—			5	62	66

*One digit multipliers (e.g. $\begin{array}{r}523\\ \underline{x4}\end{array}$): percent correct CSMP = 75, non-CSMP = 77

Two digit multipliers (e.g. $\begin{array}{r}34\\ \underline{x75}\end{array}$): percent correct CSMP = 32, non-CSMP = 43

**Division without remainder: percent correct CSMP = 59, non-CSMP = 59

Division with remainder: percent correct CSMP = 39, non-CSMP = 47

Two findings are evident. First, non-CSMP students were systematically better than CSMP students on Comparison type items, regardless of operation. Second, on the Algorithm type items, the only differences between the two groups concerned the more "advanced" of the multiplication and division algorithms, (2-digit multipliers and division with remainder), where non-CSMP students also did better.

It is interesting to compare these results with those from Mental Arithmetic scales. The two items shown below are quite illustrative.

a) Stanford Computation: $\begin{array}{r} 407 \\ \underline{\times 30} \end{array}$ CSMP: 23% correct, non-CSMP: 38%

b) Mental Arithmetic, Multiplication: 12 x 500 = ☐

CSMP: 43% correct, non-CSMP: 37%

Student Attitudes

Four sets of attitudinal items were assembled from items developed by, and with the permission of the National Assessment for Educational Progress. These were the following:

A1, Attitude Toward School Subjects (6 items)

e.g. Science: Like In Between Do not Like

etc.

A2, Time Spent on Math Activities (10 items)

e.g. Taken math tests: A lot A little Never

etc.

A3, Self Concept and Math (5 items)

e.g. I usually understand what we are talking about in mathematics

True about me Sometimes true about me Not true about me

etc.

A4, Attitude Towards Math Activities (6 items)

e.g. Playing mathematical games:

I like it a lot I like it a little I don't like it

etc.

Except for Scale A2, Time Spent on Mathematics, there were no items which produced a difference of more than 6 percentage points between CSMP and non-CSMP. Compared with NAEP's published data (based on a national sample), the present group of 51 CSMP and non-CSMP classes gave similar responses on A1, Attitude Towards School Subjects; had higher scores on A3, Self Concept and Mathematics; and had lower socres on A4, Attitude Towards Math Activities.

On Scale A2, Time Spent of Mathematics Activities, there were four items which produced substantial differences between CSMP and non-CSMP students. These are shown below, together with NAEP data.

	a lot	a little	never
Taken math tests:			
CSMP:	34%	63%	2%
non-CSMP:	47%	50%	2%
NAEP:	44%	46%	9%
Done math homework:			
CSMP:	37%	48%	14%
non-CSMP:	57%	34%	8%
NAEP:	43%	45%	12%
Played math games:			
CSMP:	48%	48%	4%
non-CSMP:	18%	63%	19%
NAEP:	31%	55%	14%
Done work sheets:			
CSMP:	87%	12%	0%
non-CSMP:	68%	28%	4%
NAEP:	71%	27%	2%

In summary, CSMP students reported doing homework and tests less, and math games and worksheets more, than non-CSMP students.

Correlations between each item and score on Stanford Reading Test were calculated separately for CSMP and non-CSMP students. For this large a number of students, correlations are significant if the absolute value is greater than about .1. Table 8 lists the items on which correlations were significant.

Table 8

Significant Correlations Between
Item Responses and Reading Score

"X": Significant for both CSMP and non-CSMP classes
"CSMP": " for CSMP students only
"Non-CSMP: " for non-CSMP students only

Items		Negative Correlation: Lower Reading Scores Associated With Response	Positive Correlation: Higher Reading Scores Associated With Response
Like a lot: (versus "in between" or "do not like")	Social Studies		X
	Math	CSMP	
	Reading		X
	Spelling	CSMP	
	P.E.	X	
Activities done a lot: (versus "a little" or "never")	Homework	X	
	Helped a classmate		CSMP
	Played math games	Non-CSMP	
	Listened to teacher explain lesson		X
	Gotten indivual help from teacher	X	
	Worked problems at the board	X	
	" " in small groups	X	
	" " alone		X
	Doing worksheets		CSMP
Self Concept: "True about me" (versus "sometimes" or "not true about me")	I usually understand what we about in math		X
	Doing math makes me nervous		X
	Math is fun for me	CSMP	
	I really want to do well		Non-CSMP
	Math is boring for me	CSMP	Non-CSMP
I like it a lot: (versus "a little" or "I don't like it")	Listen to teacher explain lesson	X	
	Working math problems alone		X

The items marked with an x (both groups responding similarly) are in the expected direction:

1. Better readers more often liked Reading and Social Studies more; poorer readers, P.E.

2. Better readers more often listened to the teacher explain a lesson and worked alone; poorer readers did homework, got individual help from the teacher, worked problems at the board, and in small groups.

3. Better readers more often understood the math and were more often nervous about math (which might be a surprise).

4. Better readers more often liked to work alone, poorer readers to listen to the teacher.

Only for non-CSMP students:

1. Better readers more often wanted to do well.

2. Poorer readers more often played math games.

Only for CSMP students:

1. Better readers more often helped a classmate and did worksheets.

2. Poorer readers more often liked Math and Spelling, thought math was fun and thought math was boring!

The only item which produced opposite significance was the statement "Math is boring for me", more often answered by higher scoring readers in non-CSMP and by lower scoring readers in CSMP.

Correlational Data

Two kinds of correlational data are summarized here: test reliability and correlation between reading scores and MANS scores. Each of these is reported separately in the scale-by-scale analysis in Appendix B.

Reliability Data

The KR20 reliability coefficient was calculated for each test. This is a measure of test homogeneity, or the degree to which the various items of the test are measuring the same underlying ability. This coefficient is affected by by test length and about half the scales contained no more then 7 items. In order to make comparisons across scales, the KR20's were adjusted, using the Spearman Brown formula, to give an estimate of what the reliability would be for a 15 item test. (But Appendix B reports the unadjusted KR20's.)

After adjustment, the median KR20 for the 25 scales was .82 and only two were below .74. The two exceptions were C3, Mental Arithmetic Addition (.68) whose mean of 70 percent correct made it the easiest scale, and R3, Boxes Counting By (.65), whose two-option response format made it the most susceptible to guessing.

There was very little difference between the unadjusted KR20's for CSMP classes versus non-CSMP classes, usually about .04. Only one scale had a difference larger than .10: C3, Mental Arithmetic (KR20 for CSMP students = .45, for non-CSMP students = .57).

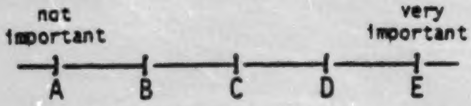
Reading - MANS Correlations

The correlations between the Stanford Achievement Reading Test and the various MANS scales varied within a remarkably narrow range, from .36 to .53 (using the average of the CSMP-non-CSMP correlations). For CSMP students, the correlations were from .1 to .2 higher on C4 and C5 (Mental Arithmetic, Subtraction and Multiplication respectively) and on R4 (Boxes, Multiplying By). For non-CSMP students the correlations were higher for one of the Stanford Computation scales, for C3 (Mental Arithmetic, Addition) and for W1 (Extraneous Word Problem). Otherwise, there was little CSMP-non-CSMP difference in Reading/MANS correlations.

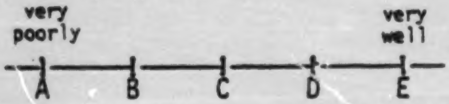
Teacher Evaluation of MANS Scales

For each MANS scale, a mean score was calculated across CSMP teachers and across non-CSMP teachers for their responses to two questions:

How important it this general goal?

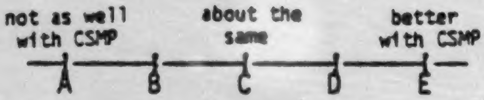

not important
very important
A
B
C
D
E

How well is this goal assessed by this particular test?


very poorly
very well
A
B
C
D
E

Also, for each scale a mean score was calculated across CSMP teachers only for the following question:

Will CSMP enable students to do better on this test than they would with an ordinary textbook program?


not as well with CSMP
about the same
better with CSMP
A
B
C
D
E

(Responses were coded 1,..., 5 respectively. Teachers were actually presented each time with the test items and a rather general goal statement; in fact they saw virtually the same pages as are in Appendix A.)

Table 6

Mean Scores, Teacher Ratings of MANS Scales

	Importance of Goal?		How well does test measure goal?		Will CSMP students do better?
Scales	CSMP	Non-CSMP	CSMP	Non-CSMP	(CSMP teachers only)
Mean across: Computation	4.5	4.4	4.3	4.6	3.4
Estimation	4.3	4.0	4.1	3.9	3.5
Geometry	3.6	3.5	3.8	3.8	3.4
Other Number Systems	4.1	3.6	3.9	3.8	4.0
Probability	2.9	2.7	3.2	3.4	4.0
Number Relations	4.1	3.9	4.2	3.9	4.1
Place Value	4.1	4.2	4.3	4.3	3.8
Word Problems	4.7	4.5	4.5	4.4	3.5
Mean across all scales	4.2	4.0	4.1	4.0	3.8

a) CSMP teachers tended to rate the importance of the goal one or two tenths higher than did non-CSMP teachers, except Other Number Systems which had a larger difference. The tests were judged to be measuring the goal about equally well for both groups.

b) For both groups, Computation and Word Problems were rated as most important and best measured, with Geometry and Probability lowest on these ratings.

c) The largest, and statistically significant, differences between the two groups regarding the importance of the goals for individual scales (not shown in table) were for Scales E1, E5, N2 and R2, which CSMP teachers rated higher.

d) CSMP teachers predicted fairly well which scales their students would do better on, except for Estimation and Word Problems (especially W2) where they under-predicted their students' performance.

Comparison of CSMP-Non-CSMP Teacher Questionnaire Responses

CSMP and non-CSMP teachers completed a questionnaire during the administration of the MANS. Results are summarized below for those fourth grade teachers participating in this study. (Evaluation Report 6-C-1 describes responses of all third, fourth and fifth grade CSMP teachers.) All responses are in percentages. An asterisk beside the item numberal indicates a substantial difference between the responses of CSMP teachers versus non-CSMP teachers.

*1. "About how long is the math period each day?"

	<45	45-50	51-59	≥60	Variable
CSMP	9	23	5	36	27
non-CSMP	37	37	5	10	10

2. Number of years teaching experience

	First year	2-5	6-10	>10
CSMP	0	9	39	52
non-CSMP	6	11	28	55

*3. "About what percent of time is spent on teacher-led work?"

	≥75%	51-74%	50%	<50%
CSMP	27	45	18	10
non-CSMP	21	16	11	52

*4a) Achievement is oriented towards basic skills   A B C D E   Achievement is oriented towards more general progress

Mean Score = CSMP teachers = 3.3, non-CSMP = 2.1
(Scored by: A=1, B=2, ..., E=5, so that higher scores are associated with with response at the right hand end of the scale.)

4b) (Same format and scoring as in a)

My lesson plans:
are followed in great detail ____________ allow for frequent distribution
CSMP = 2.8, non-CSMP = 3.0

4c) Pace of lessons:
moves along smartly ____________ is quite thorough
CSMP = 2.9, non-CSMP = 2.6

4d) Content of lessons is:
challenging for most students ____________ easily mastered by most students
CSMP = 2.2, non-CSMP = 2.4

4e) Best learning takes place when:
teacher leads class ____________ students work on their own
CSMP = 2.4, non-CSMP = 2.7

*4f) Math class is one of my:
favorite times of the day ____________ least favorite times
CSMP = 1.7, non-CSMP = 2.1

*4g) Math class has a:
business like atmosphere ____________ fun atmosphere
CSMP = 3.3, non-CSMP = 2.9

*4h) Oriented towards:
Solving specific problems ____________ creative activities
CSMP = 3.2, non-CSMP = 2.4

4i) Math is one of the:
harder subjects to teach ____________ easier subjects to teach
CSMP = 3.7, non-CSMP = 3.8

5. "Have you ever been math anxious?"

	CSMP	Non-CSMP
Never or hardly ever	39	26
Occasionally as a student, but not as an adult	30	37
Still am once in a while	30	26
I am definitely a math anxious person	0	11

6. "How would you rate {CSMP
your present math program, compared to previous math programs you have used, on the following items?"

*a) Overall quality

(Scored 1,2,..5 respectively)
Mean score, CSMP teachers = 4.0, non-CSMP teachers = 3.3

*b) Student interest and involvement?
CSMP = 4.1, non-CSMP = 3.4

c) Students' achievement in computational skills
CSMP = 2.9, non-CSMP = 3.0

d) Students' achievement in mathematical concepts
CSMP = 3.6, non-CSMP = 3.3

*e) Students' ability to do logical reasoning
CSMP = 4.4, non-CSMP = 3.0

*f) Students' facility in solving word problem
CSMP = 3.4, non-CSMP = 2.5

g) Appropriateness for low ability students
CSMP = 2.7, non-CSMP = 2.6

*h) Appropriateness for high ability students
CSMP = 4.4, non-CSMP = 3.4

*7. "Were there any skills or concepts that your math program assumed students would know at the beginning of the year, which in fact many did not know?"

		CSMP	Non-CSMP
Yes:	basic facts	60	44
	algorithms	50	17
	decimals or fractions	15	0
	others, specific to particular program used	45	11
No:		15	33

(Multiple answers were possible, thus percentages do not sum to 100.)

*8. "Are there any skills or concepts that you think students should know by the end of fourth grade which are not adequately covered by your math program?"

		CSMP	Non-CSMP
Yes:	computation facts/algorithms	72	6
	fractions	0	6
	decimals	0	12
	combination of above	22	12
	other	0	23
No:		6	47

9. "Over the course of the year, about what percent of the math time is used to supplement your math text with additional activities?"

	10%	10-19%	20-29%	30-50%	75%
CSMP	22	22	22	22	11
Non-CSMP	13	13	31	38	6

*10. "What are the best aspects of your math program?"

	CSMP	Non-CSMP
Logical thinking/problem solving	57	—
Fun/interesting/motivating	30	—
Spiral approach/variety	27	25
Variable difficulty/challenging	22	8
Mental work	13	—
Covers basics	—	—
Math applied to everydy life	—	17
Individualized	—	17
Other specific responses	61	25

(Multiple answers were possible)

It is hard to know whether to attribute differences in responses to teacher attitudes in general or to intrinsic differences in the curriculum. For most items it would appear to be the curriculum that is making the difference; furthermore the method of selecting comparison classes (usually from adjacent schools) argues against large differences in teacher attitudes independent of the curriculum.

Nevertheless, whenever it is not possible to randomly assign teachers to CSMP and non-CSMP classes, one must always bear in mind the possibility that systematic differences in teachers may contribute to the generally positive results for CSMP. Perhaps the items which most support this possibility are those indicating that math class is longer and a more "fun" time of the day for CSMP teachers than for non-CSMP teachers (though even these items can also be interpreted as reflecting curriculum rather than teacher differences.)

Appendix A

Student Copies of MANS Tests plus Abbreviated Directions

Computation Scales:

C1 Stanford Achievement Test A1
C2 Fractions (Supplement to S.A.T. . . . . A 3
C3-6 Mental Arithmetic . . . . A 4

Estimation Scales:

E1 2, 5, or 10 . . . . A 5
E2-4 Estimating Intervals. . . . . A 6
E5 Word Problem Approximation. . . . . A 7

Geometry Scale:

G1 Geometric Congruencies. . . . . A 8

Number Systems Scales:

N1 Decimal Gas . . . . A 9
N2 Negative Hits and Misses . . . . A 10
N3 Measuring Fractional Inches . . . . A 11

Number Relations Scales:

R1 Solving Number Machines . . . . A 12
R2 Using Number Machines . . . . A 13
R3 Boxes (Counting By) . . . . A 14
R4 Boxes (Multiplying By). . . . . A 15
R5 Labelling Number Lines. . . . . A 16

Probability Scale:

P1 Spinners . . . . A 17

Place Value Scales:

V1 Arrowed Number Lines . . . . A 18
V2 Constructing Numbers . . . . A 19

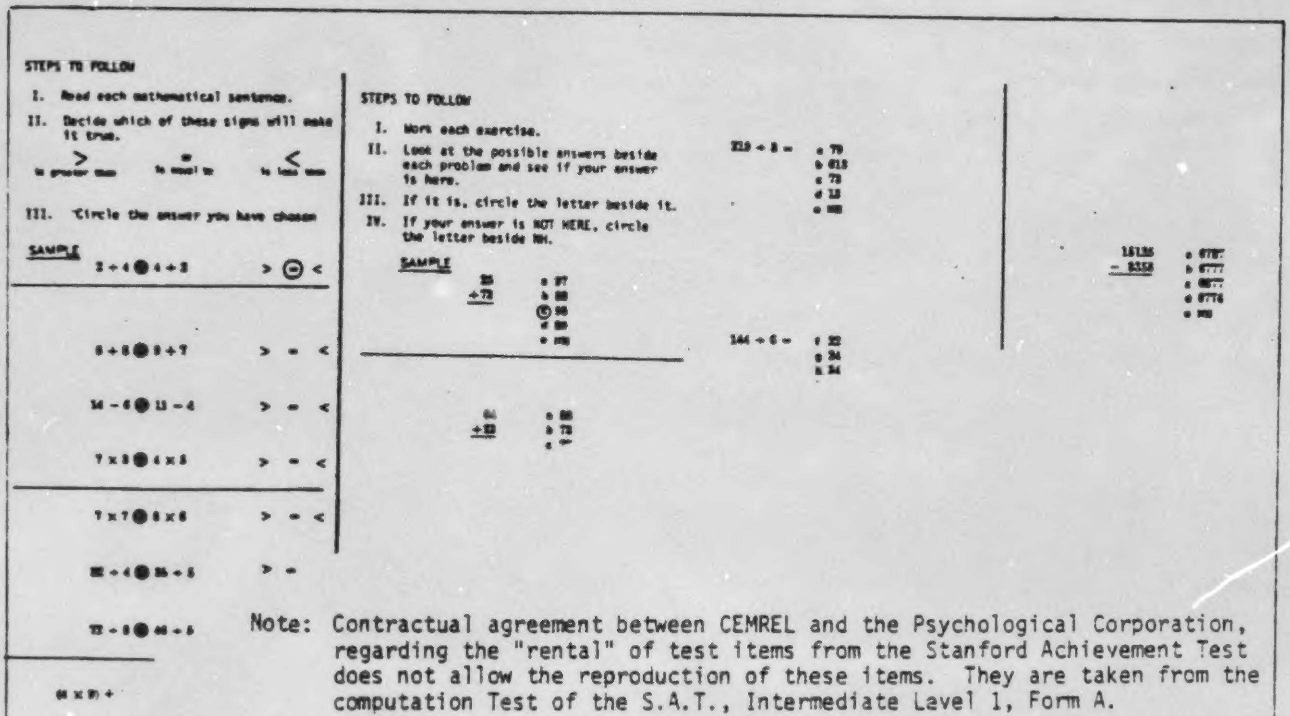
Word Problem Scales:

W1 Extraneous Data . . . . A 20
W2 Two-Stage . . . . A 21

(C1) Stanford Achievement Test: Computation (students took one of two 20-item forms)

Abstract: 40 multiple choice questions of two different types: (a) standard computation, 22 items; (b) paired comparison of two computations, 18 items. With each type, items involved each of the four operations and at least 90% involved only whole numbers.

First Alternate Form



STEPS TO FOLLOW

I. Read each mathematical sentence.

II. Decide which of these signs will make it true.

III. Circle the answer you have chosen

SAMPLE

STEPS TO FOLLOW

I. Work each exercise.

II. Look at the possible answers beside each problem and see if your answer is here.

III. If it is, circle the letter beside it.

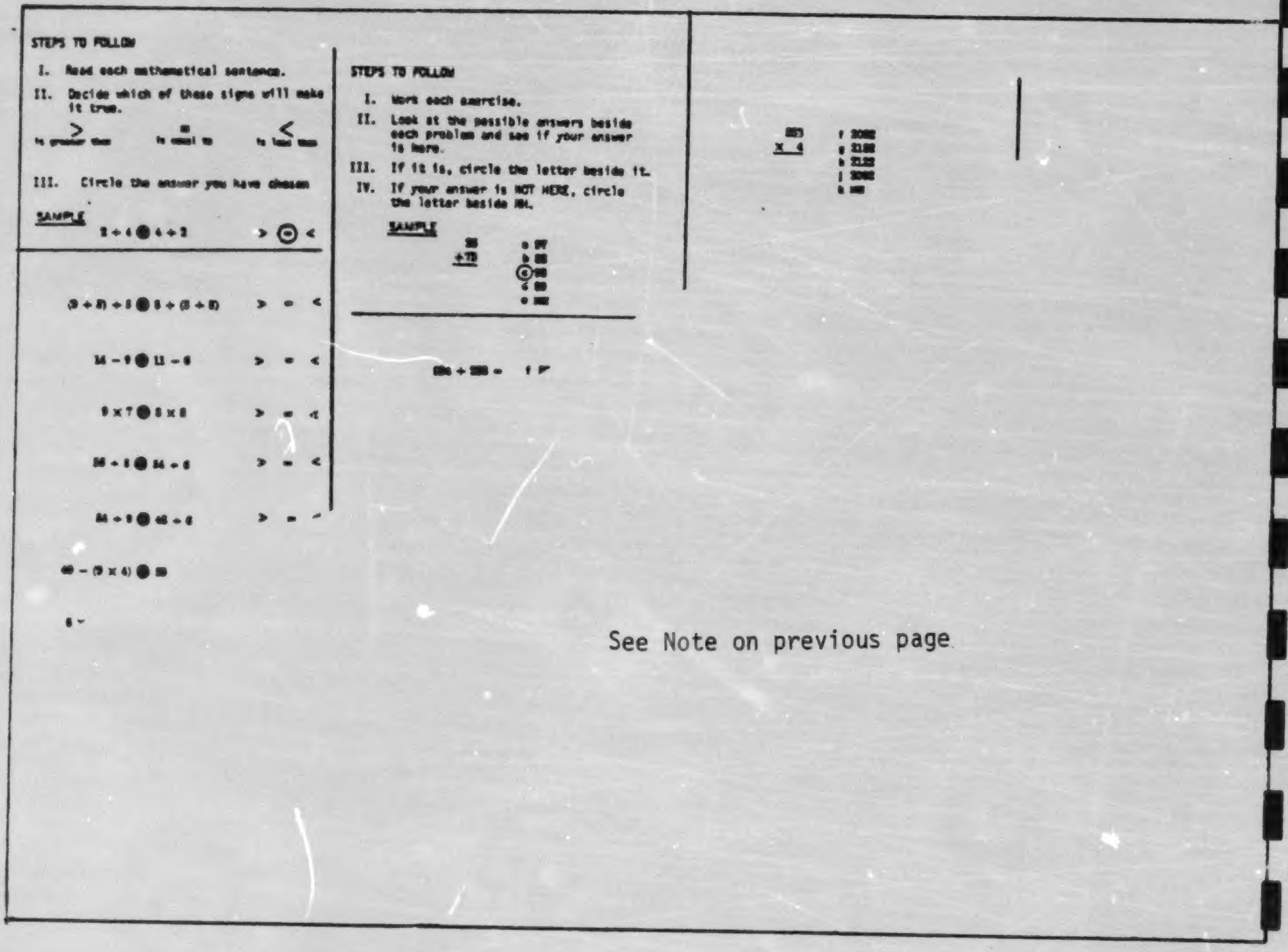
IV. If your answer is NOT HERE, circle the letter beside NH.

SAMPLE

Note: Contractual agreement between CEMREL and the Psychological Corporation, regarding the "rental" of test items from the Stanford Achievement Test does not allow the reproduction of these items. They are taken from the computation Test of the S.A.T., Intermediate Lavel 1, Form A.

(C1) continued

Second Alternate Form



STEPS TO FOLLOW

I. Read each mathematical sentence.

II. Decide which of these signs will make it true.

> is greater than = is equal to < is less than

III. Circle the answer you have chosen

SAMPLE

2 + 4 ● 4 + 2 > [✓ =] <

[illegible] ● [illegible] > = <

14 − 9 ● 11 − 6 > = <

9 × 7 ● 8 × 8 > = <

[illegible] ● [illegible] > = <

[illegible] ● [illegible] > = <

[illegible] − (9 × 4) ● [illegible]

STEPS TO FOLLOW

I. Work each exercise.

II. Look at the possible answers beside each problem and see if your answer is here.

III. If it is, circle the letter beside it.

IV. If your answer is NOT HERE, circle the letter beside NH.

SAMPLE

[illegible] + [illegible]

a [illegible]
b [illegible]
[✓ c] [illegible]
d [illegible]
e [illegible]

[illegible] + [illegible] = f [illegible]

[illegible] × 4

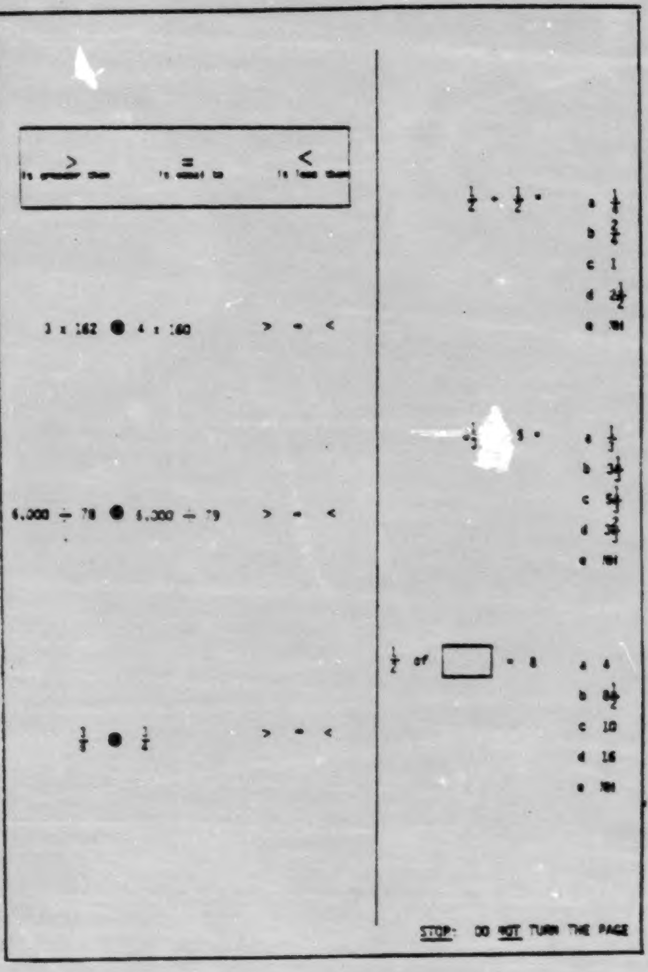
f [illegible]
g [illegible]
h [illegible]
j [illegible]
k NH

See Note on previous page

(C2) Fractions (Supplement to S.A.T. Computation)-(Students took one of two 6-item forms)

Abstract: 12 items, with 6 of each type, identical to those in C1 except that 8 involved fractions and 4 involved large number multiplication and division.

Alternate Forms



> is greater than = is equal to < is less than

3 x 162 ● 4 x 160 > = <

6,000 ÷ 78 ● 6,000 ÷ 79 > = <

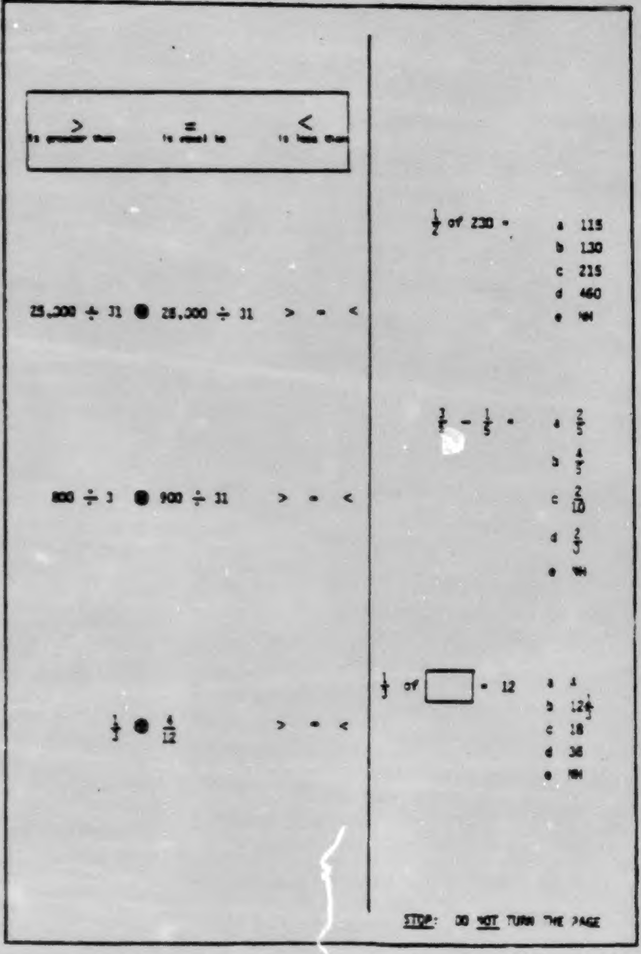
$\frac{3}{8}$ ● $\frac{1}{4}$ > = <

$\frac{1}{2} + \frac{1}{2} =$ a $\frac{1}{4}$ b $\frac{2}{4}$ c 1 d $2\frac{1}{2}$ e NH

[illegible] $\frac{1}{3}$ 5 = a $\frac{1}{3}$ b $3\frac{1}{3}$ c $5\frac{1}{3}$ d $3\frac{2}{3}$ e NH

$\frac{1}{2}$ of ☐ = 8 a 4 b $8\frac{1}{2}$ c 10 d 16 e NH

STOP: DO NOT TURN THE PAGE



> is greater than = is equal to < is less than

25,200 ÷ 31 ● 28,000 ÷ 31 > = <

800 ÷ 3 ● 900 ÷ 31 > = <

$\frac{1}{3}$ ● $\frac{4}{12}$ > = <

$\frac{1}{2}$ of 230 = a 115 b 130 c 215 d 460 e NH

$\frac{3}{5} - \frac{1}{5} =$ a $\frac{2}{5}$ b $\frac{4}{5}$ c $\frac{2}{10}$ d $\frac{2}{3}$ e NH

$\frac{1}{3}$ of ☐ = 12 a 4 b $12\frac{1}{3}$ c 18 d 36 e NH

STOP: DO NOT TURN THE PAGE

General Goal: Do comparisons of, and simple computations with, fractions.

(C3) Mental Arithmetic: Addition

Abstract: An open number sentence involving addition must be completed without aid of pencil and paper. 5 items

(C4) Mental Arithmetic: Subtraction

Abstract: Same as C3, but with subtraction, 5 items.

(C5) Mental Arithmetic: Multiplication

Abstract: Same as C3, but with multiplication, 8 items.

(C6) Mental Arithmetic: Division

Abstract: Same as C3, but with division, 8 items.

Alternate Forms (Students took either C3 + C6 or C4 + C5)

72 – 4 = ☐

1,000 – 5 = ☐

700 – 401 = ☐

525 – ☐ = 225

☐ - 250 = 150

53 + 8 = ☐

3,009 + 3,001 + 3,001 = ☐

542 + 99 = ☐

☐ + 125 = 250

989 + ☐ = 1,000

Directions: Problems to be done mentally, i.e. no scratch work allowed.

General Goal: Do mental computations with large numbers which lend themselves to easy calculations.

(E1) 2, 5 or 10

Abstract: Quickly estimate whether a given number is about 2 or 5 or 10 times as large as another given number, 13 items.

2 or 5 or 10

60 is about _____ times as large as 31

150 is about _____ times as large as 7

65 is about _____ times as large as 12

299 is about _____ times as large as 21

100 is about _____ times as large as 19

98 is about _____ times as large as 50

45 is about _____ times as large as 8

602 is about _____ times as large as 298

503 is about _____ times as large as 49

59 is about _____ times as large as 29

12 is about _____ times as large as 2½

20½ is about _____ times as large as 9½

5½ is about _____ times as large as ½

Directions: Exactly 1½' allowed; first question is done as a sample.

General Goal: Estimate the relationship between two numbers where there is no exact answer.

(E2) Estimating Intervals: Addition

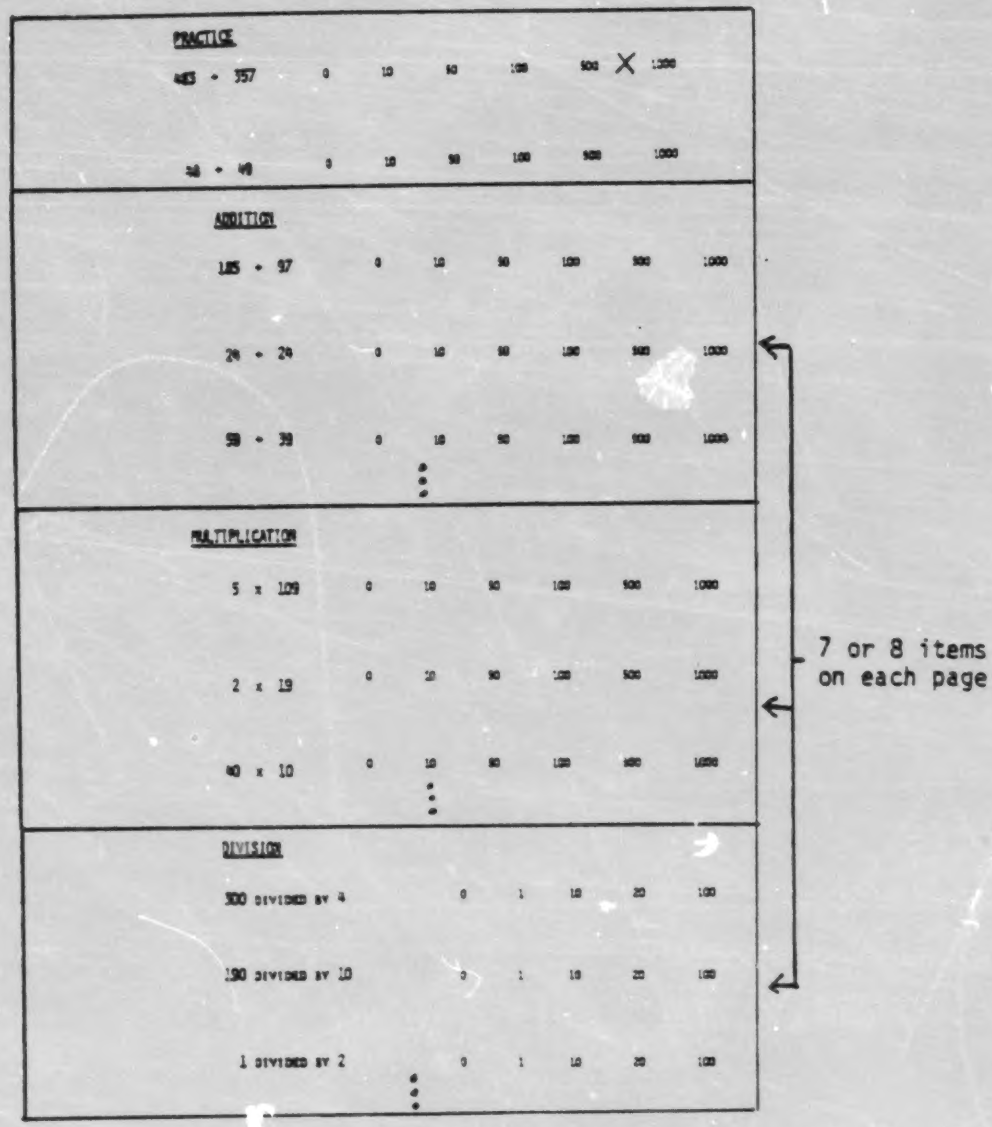
Abstract: Quickly estimate which of 5 intervals contains the answer to a series of computation problems, 8 items.

(E3) Estimating Intervals: Multiplication

Abstract: Same as E2, except multiplication, 7 items.

(E4) Estimating Intervals: Division

Abstract: Same as E2, except division, and only 4 intervals, 8 items.



PRACTICE

485 + 357 0 10 50 100 500 X 1000

48 + 49 0 10 50 100 500 1000

ADDITION

185 + 97 0 10 50 100 500 1000

24 + 24 0 10 50 100 500 1000

59 + 39 0 10 50 100 500 1000

MULTIPLICATION

5 x 109 0 10 50 100 500 1000

2 x 19 0 10 50 100 500 1000

40 x 10 0 10 50 100 500 1000

DIVISION

300 DIVIDED BY 4 0 1 10 20 100

190 DIVIDED BY 10 0 1 10 20 100

1 DIVIDED BY 2 0 1 10 20 100

7 or 8 items on each page

Directions: "Just look at the problem and decide where the 'x' should go. Don't try to calculate the exact answer." Two samples were done and 1½ minutes were allowed for each of the addition, multiplication and division pages.

General Goal: Estimate the answer to whole number computations.

(E5) Word Problem Approximations

Abstract: Quickly choose one of 4 round-number answers as closest to the exact answer to a word problem with relatively easy calculations, 6 items

Sam has $8.48.
Jill has $6.47.
About how much do they have altogether?

$14 $15 $16 $17

1. George has $902.
He wants to buy a piano costing $1,348.
About how much more money does he need?

$250 $350 $450 $550

2. Tom and Bill had a long distance race.
Bill ran it in 32 minutes, 2 seconds.
Tom ran it in 29 minutes, 34 seconds.
About how much did Tom win by?

$1\frac{1}{2}$ minutes $2\frac{1}{2}$ minutes $3\frac{1}{2}$ minutes $4\frac{1}{2}$ minutes

3. A white pine will grow to be about 100 feet tall.
A blue spruce will grow to be about 30 feet tall.
A white pine will grow about how many times as tall as a blue spruce?

2 times 3 times 5 times 10 times

4. Martha can walk 2 blocks in 5 minutes.
About how many blocks can she walk in 13 minutes?

5 blocks 10 blocks 15 blocks 18 blocks

5. Susan has $131.
Chairs cost $32.
About how many chairs can Susan buy?

2 chairs 4 chairs 6 chairs 10 chairs

6. It takes 3 or 4 cups of water to cook one dozen eggs.
Mary has to cook 5 dozen eggs.
About how many cups of water will she need?

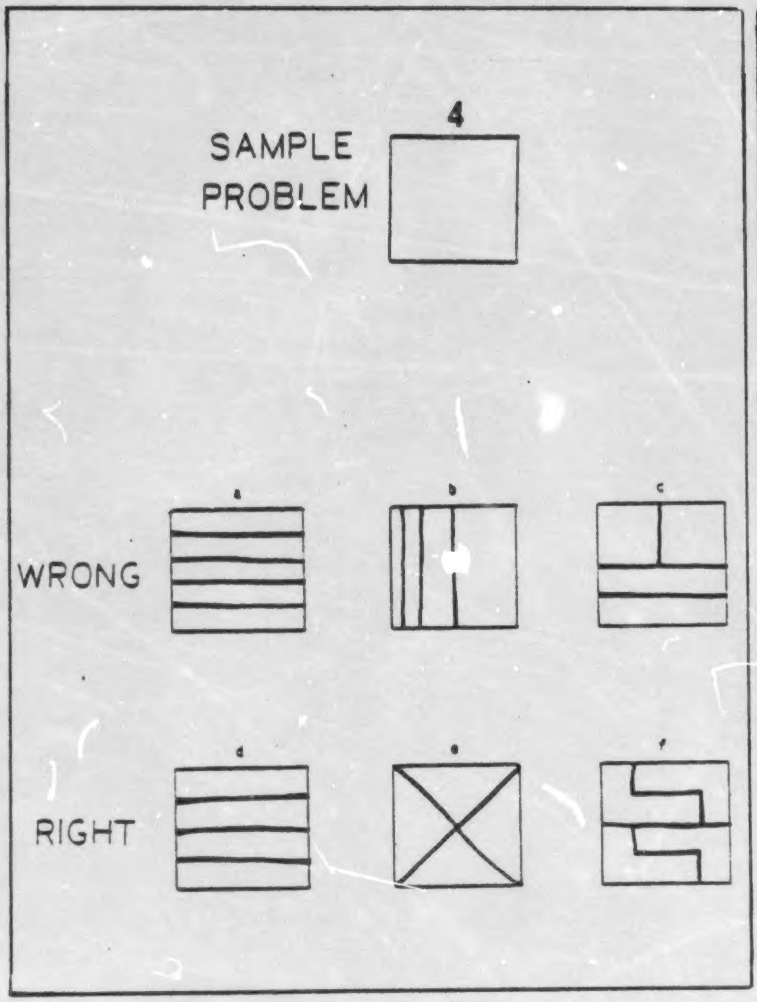
8 cups 12 cups 16 cups 25 cups

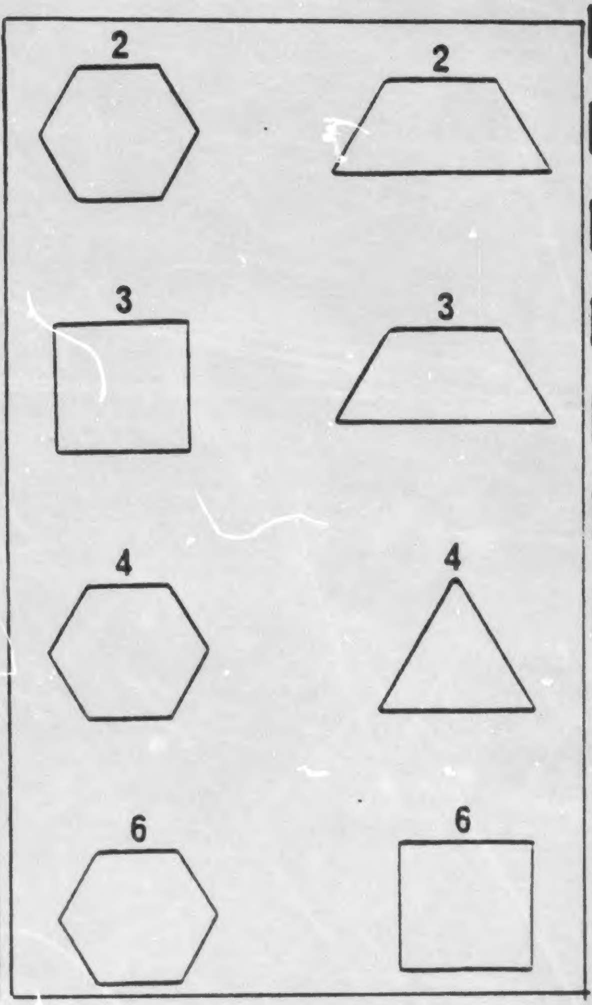
Directions: Multiple choice; tester reads each question and allows about 15 seconds for the students to pick their answers. Question inside the box is done as a sample.

General Goal: Estimate, in round numbers, the answer to word problems.

· (G1) Geometric Congruencies

Abstract: After examining 3 correct and 3 incorrect solutions to a sample problem, given a regular geometric shape and a number of parts, the shape must be divided into that many congruent parts, 8 items.



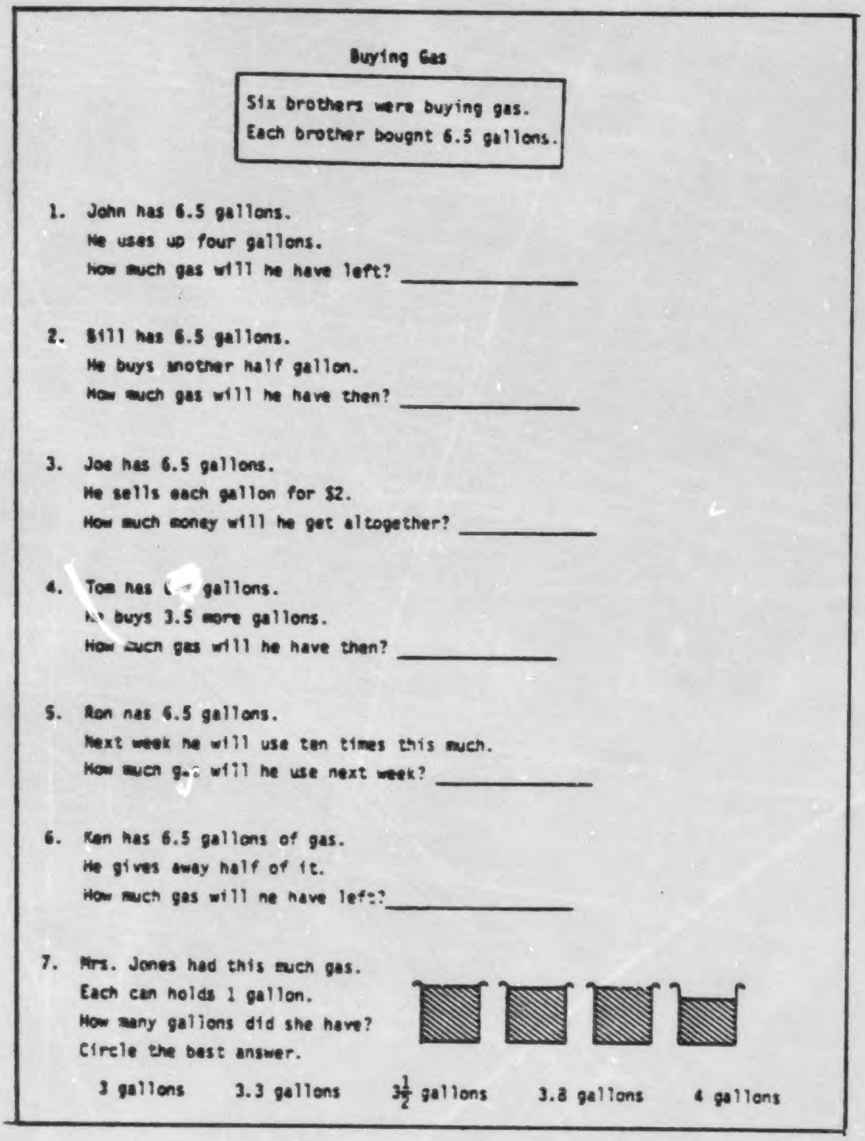


Directions: Draw lines to divide each figure into the indicated number of congruent parts. The first page was done as an illustration.

General Goal: Visualize congruent parts of common geometric shapes.

(N1) Decimal Gas

Abstract: With word problems about gasoline, one step solutions are required in which the numbers involve decimals, 7 items.



Buying Gas

Six brothers were buying gas.
Each brother bought 6.5 gallons.

1. John has 6.5 gallons.
He uses up four gallons.
How much gas will he have left? ____________

2. Bill has 6.5 gallons.
He buys another half gallon.
How much gas will he have then? ____________

3. Joe has 6.5 gallons.
He sells each gallon for $2.
How much money will he get altogether? ____________

4. Tom has [illegible] gallons.
He buys 3.5 more gallons.
How much gas will he have then? ____________

5. Ron has 6.5 gallons.
Next week he will use ten times this much.
How much gas will he use next week? ____________

6. Ken has 6.5 gallons of gas.
He gives away half of it.
How much gas will he have left? ____________

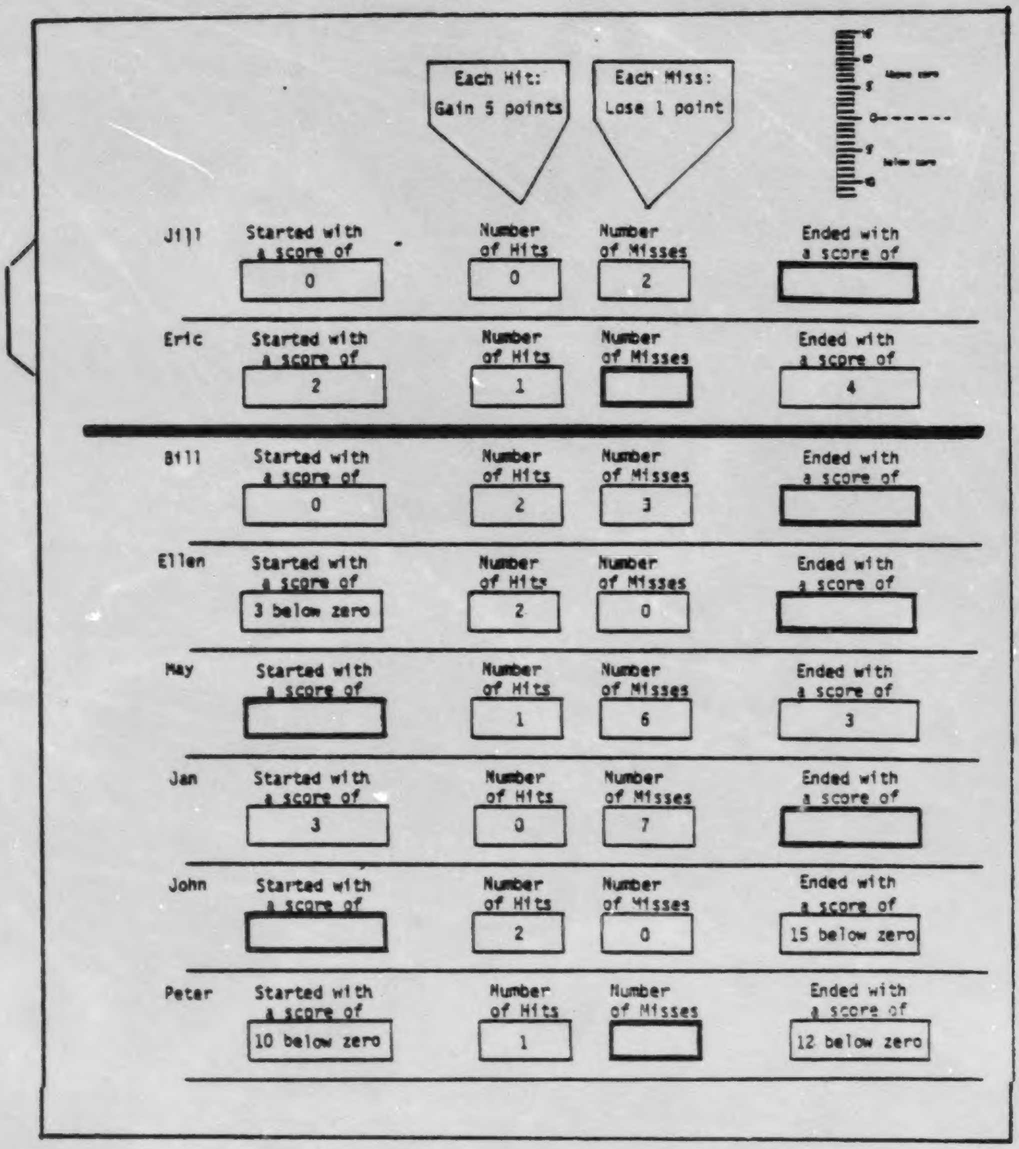
7. Mrs. Jones had this much gas.
Each can holds 1 gallon.
How many gallons did she have?
Circle the best answer.

3 gallons   3.3 gallons $3\frac{1}{2}$ gallons   3.8 gallons   4 gallons

General Goal: Solve word problems involving computations with decimals.

(N2) Negative Hits and Misses

Abstract: Given two rules [(a) each hit means a gain of 5 points (b) each miss means a loss of 1 point] and given a vertical number line running from 12 below zero to 15 above, players turns are described in part with the required task being to to complete the description, 6 items.



15
10
above zero
5
0
5
below zero
10

Each Hit: Gain 5 points

Each Miss: Lose 1 point

Samples

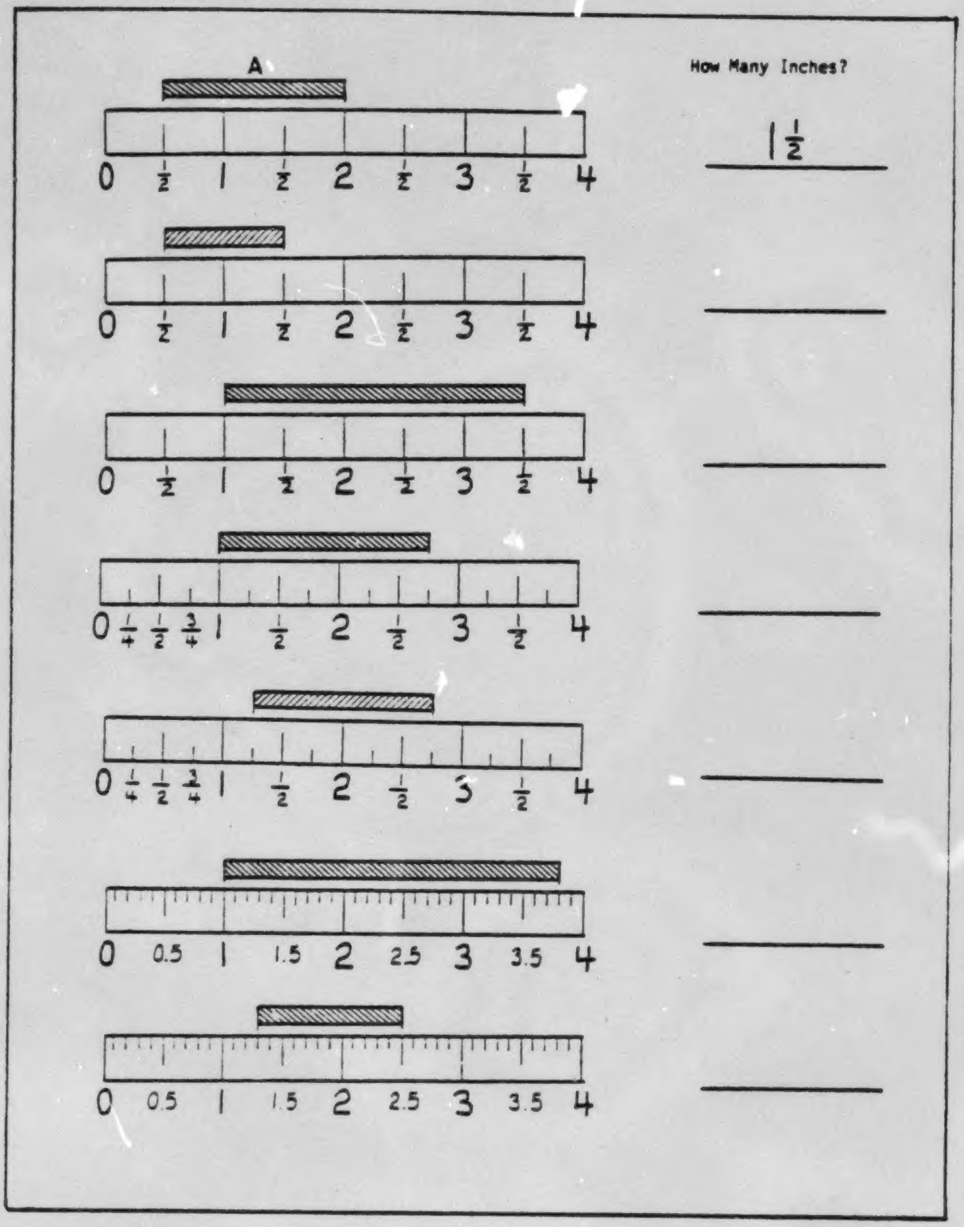
	Started with a score of	Number of Hits	Number of Misses	Ended with a score of
Jill	0	0	2	
Eric	2	1		4
Bill	0	2	3	
Ellen	3 below zero	2	0	
May		1	6	3
Jan	3	0	7	
John		2	0	15 below zero
Peter	10 below zero	1		12 below zero

Directions: Rules of the game are given at the top of the page and the first two questions ("Jill" and "Eric") are done as samples.

General Goal: Apply simple arithmetic processes in a situation involving the concept of negative numbers.

(N3) Measuring Fractional Inches

Abstract: Calculate the length of a given bar laid along a ruler marked in 1/2, 1/4 or 1/10 inches, 6 items.

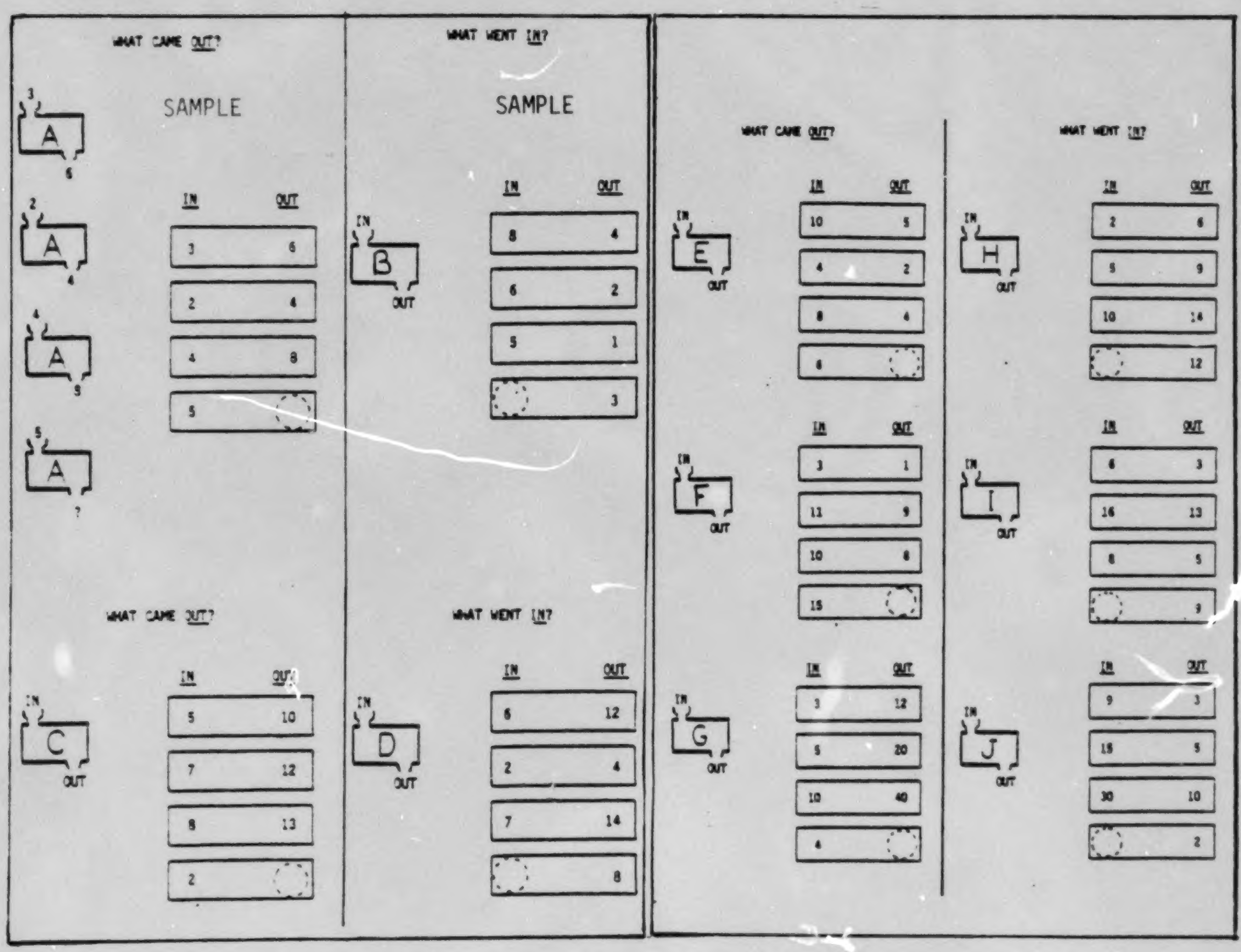

A
How Many Inches?
$1\frac{1}{2}$
0 ½ 1 ½ 2 ½ 3 ½ 4
0 ¼ ½ ¾ 1 ½ 2 ½ 3 ½ 4
0 0.5 1 1.5 2 2.5 3 3.5 4

Directions: The first one is done as a sample. Attention is drawn to the different type of ruler in the last two problems.

General Goal: Apply simple computations with fractions and decimals to measuring lengths.

(R1) Solving Number Machines

Abstract: From 3 pairs of numbers, determine what the machine is doing to produce the second number from the first and use this knowledge to find the missing number from the 4th pair, 8 items.



WHAT CAME OUT?

SAMPLE

IN	OUT
3	6
2	4
4	8
5	

WHAT WENT IN?

SAMPLE

IN	OUT
8	4
6	2
5	1
	3

WHAT CAME OUT?

IN	OUT
5	10
7	12
8	13
2	

WHAT WENT IN?

IN	OUT
6	12
2	4
7	14
	8

WHAT CAME OUT?

IN	OUT
10	5
4	2
8	4
6	

IN	OUT
3	1
11	9
10	8
15	

IN	OUT
3	12
5	20
10	40
4	

WHAT WENT IN?

IN	OUT
2	6
5	9
10	14
	12

IN	OUT
6	3
16	13
8	5
	9

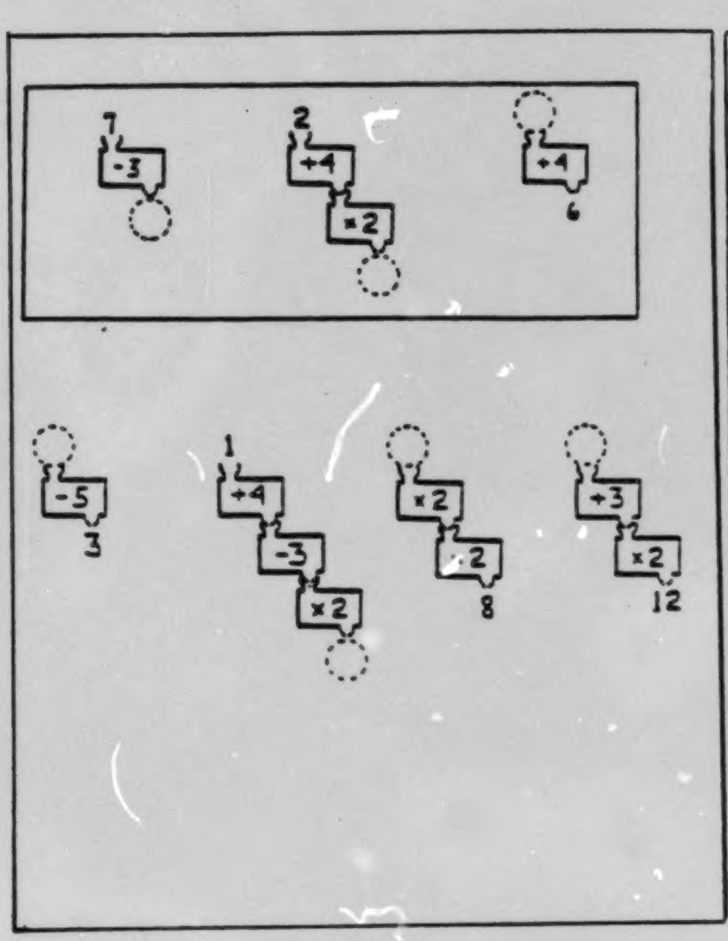
IN	OUT
9	3
15	5
30	10
	2

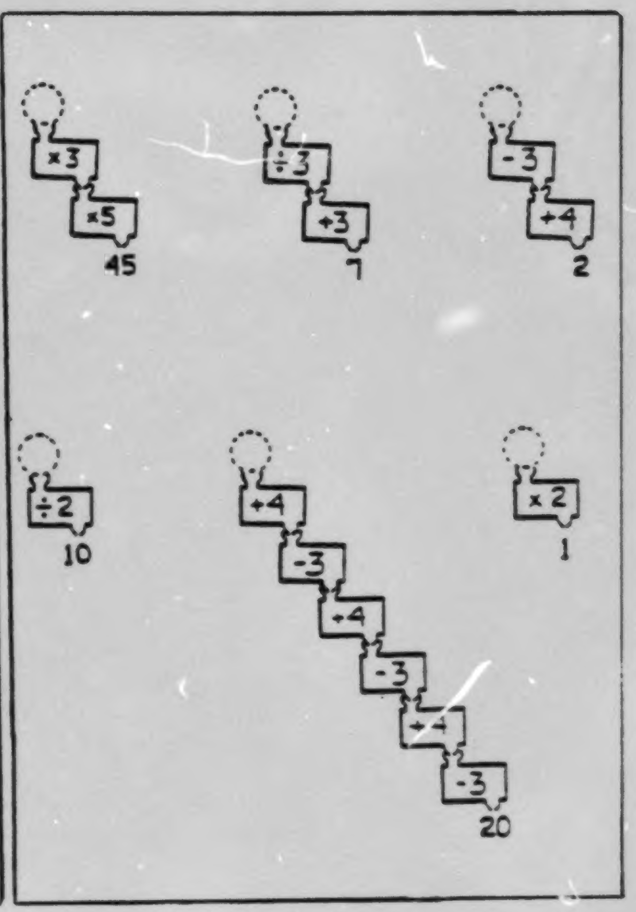
Directions: For any number going in (IN), the number machine either adds, subtracts, multiplies or divides it by the same thing each time, to produce a new number (OUT).

General Goal: Determine the common relationship between given pairs of numbers and apply it to new numbers.

(R2) Using Number Machines (only done by students previously doing R1)

Abstract: Given a number of labelled machines in sequence, find the initial or the terminating number, given the other, 10 items.


7
-3
2
+4
×2
+4
6
-5
3
1
+4
-3
×2
×2
÷2
8
+3
×2
12

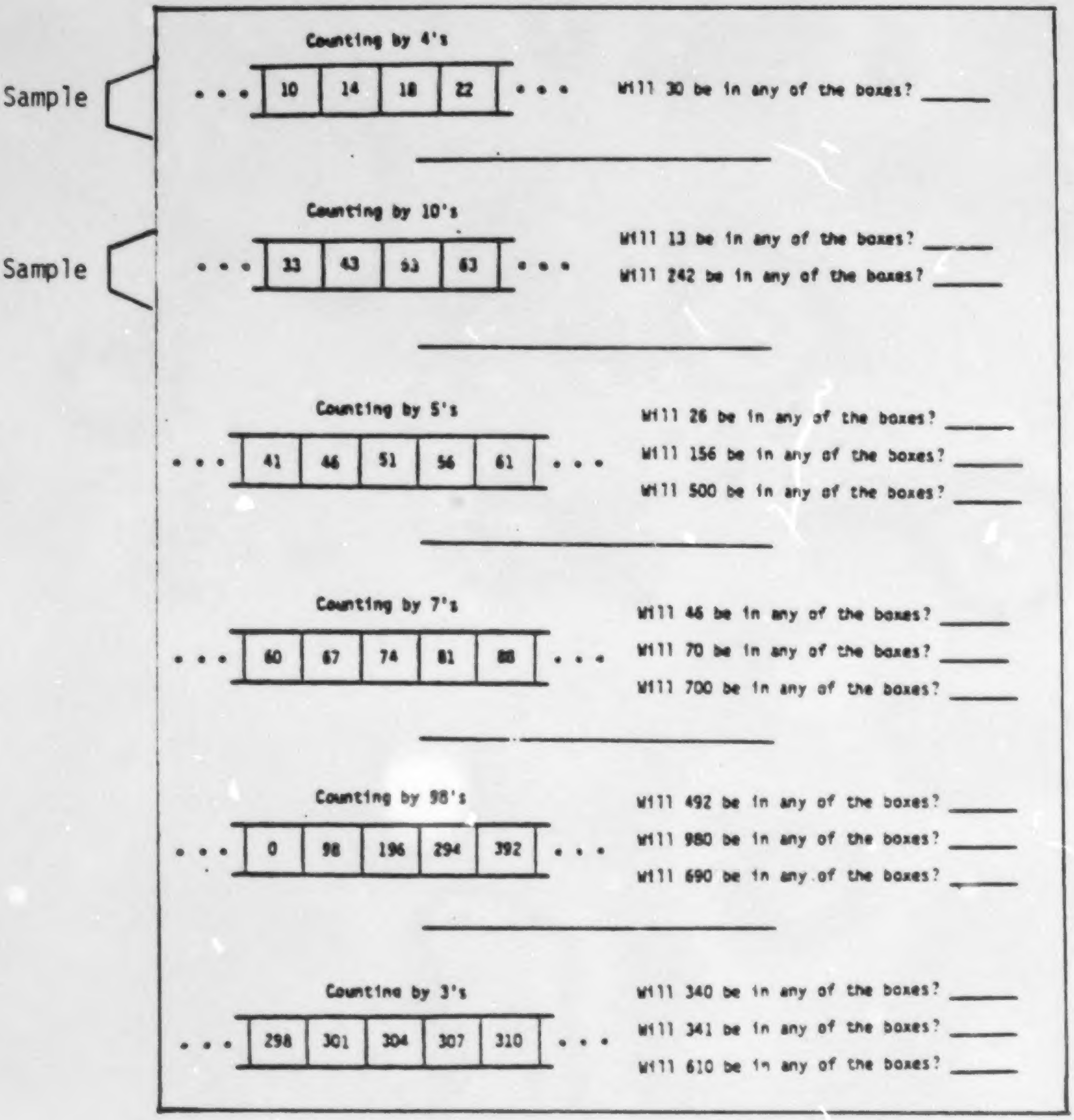

×3
×5
45
÷3
+3
7
-3
+4
2
÷2
10
+4
-3
+4
-3
+4
-3
20
×2
1

Directions: See previous test with number machines, except that here it says what each machine does. Questions inside the box are done as samples.

General Goal: Use given number relationships to solve problems, including sequential and "backward" problems.

(R3) Boxes: Counting by

Abstract: Presented with an infinite series of boxes each of which contains a member of an additive series of numbers, questions are asked about the series' membership of other numbers, 4 different series, 12 questions (3 on each one series).



Sample

Counting by 4's

. . . | 10 | 14 | 18 | 22 | . . .

Will 30 be in any of the boxes? ______

Sample

Counting by 10's

. . . | 33 | 43 | 53 | 63 | . . .

Will 13 be in any of the boxes? ______

Will 242 be in any of the boxes? ______

Counting by 5's

. . . | 41 | 46 | 51 | 56 | 61 | . . .

Will 26 be in any of the boxes? ______

Will 156 be in any of the boxes? ______

Will 500 be in any of the boxes? ______

Counting by 7's

. . . | 60 | 67 | 74 | 81 | 88 | . . .

Will 46 be in any of the boxes? ______

Will 70 be in any of the boxes? ______

Will 700 be in any of the boxes? ______

Counting by 98's

. . . | 0 | 98 | 196 | 294 | 392 | . . .

Will 492 be in any of the boxes? ______

Will 980 be in any of the boxes? ______

Will 690 be in any of the boxes? ______

Counting by 3's

. . . | 298 | 301 | 304 | 307 | 310 | . . .

Will 340 be in any of the boxes? ______

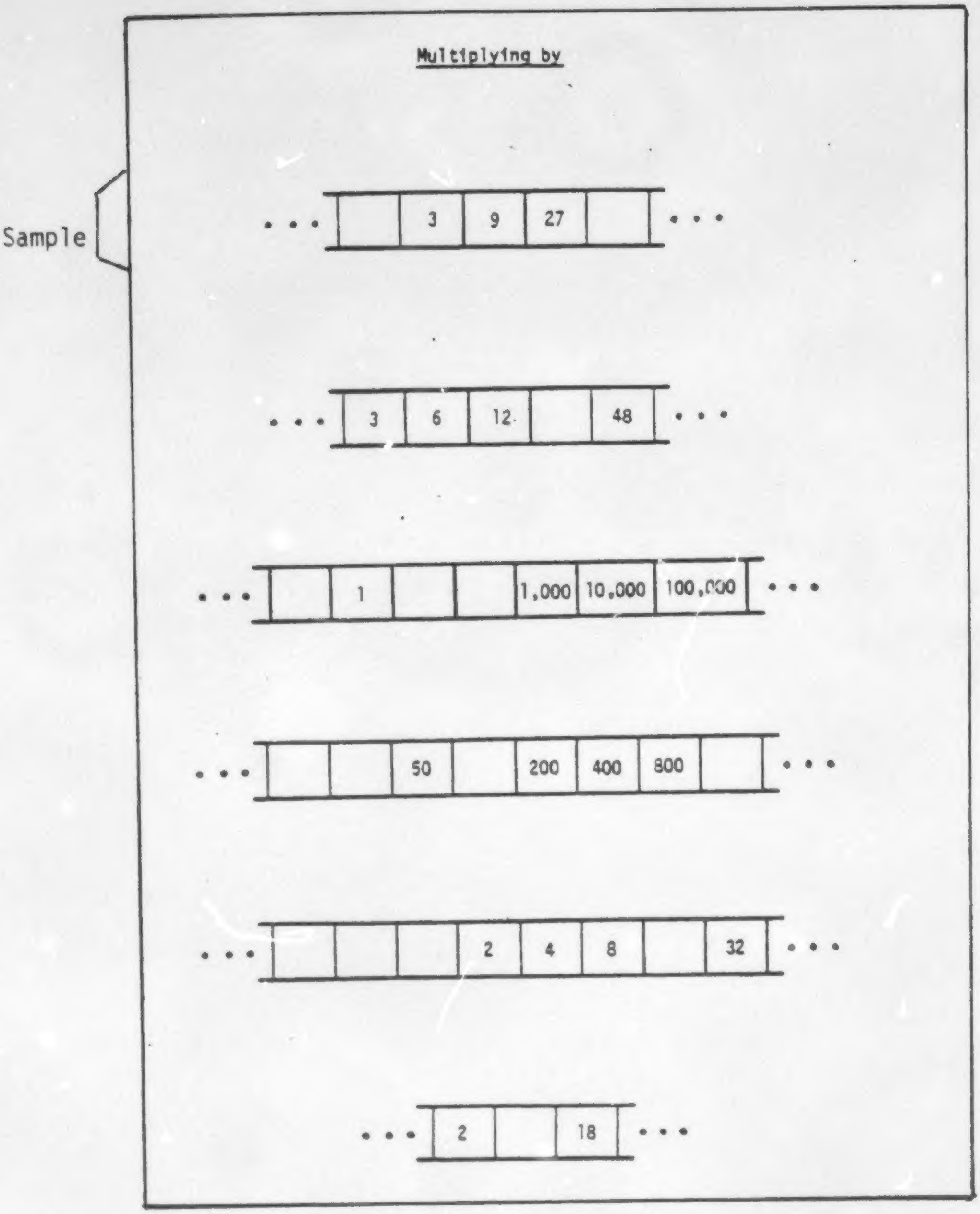
Will 341 be in any of the boxes? ______

Will 610 be in any of the boxes? ______

General Goal: Conceptualize an "additive" series of numbers and extrapolate to new numbers in the series.

(R4) Boxes: Multiplying By

Abstract: Same idea and format as in R3 except that the series is multiplicative and specific empty boxes are to be filled in, 5 series, 13 items (empty boxes).



Multiplying by

Sample

• • •		3	9	27		• • •

• • •	3	6	12		48	• • •

• • •		1			1,000	10,000	100,000	• • •

• • •			50		200	400	800		• • •

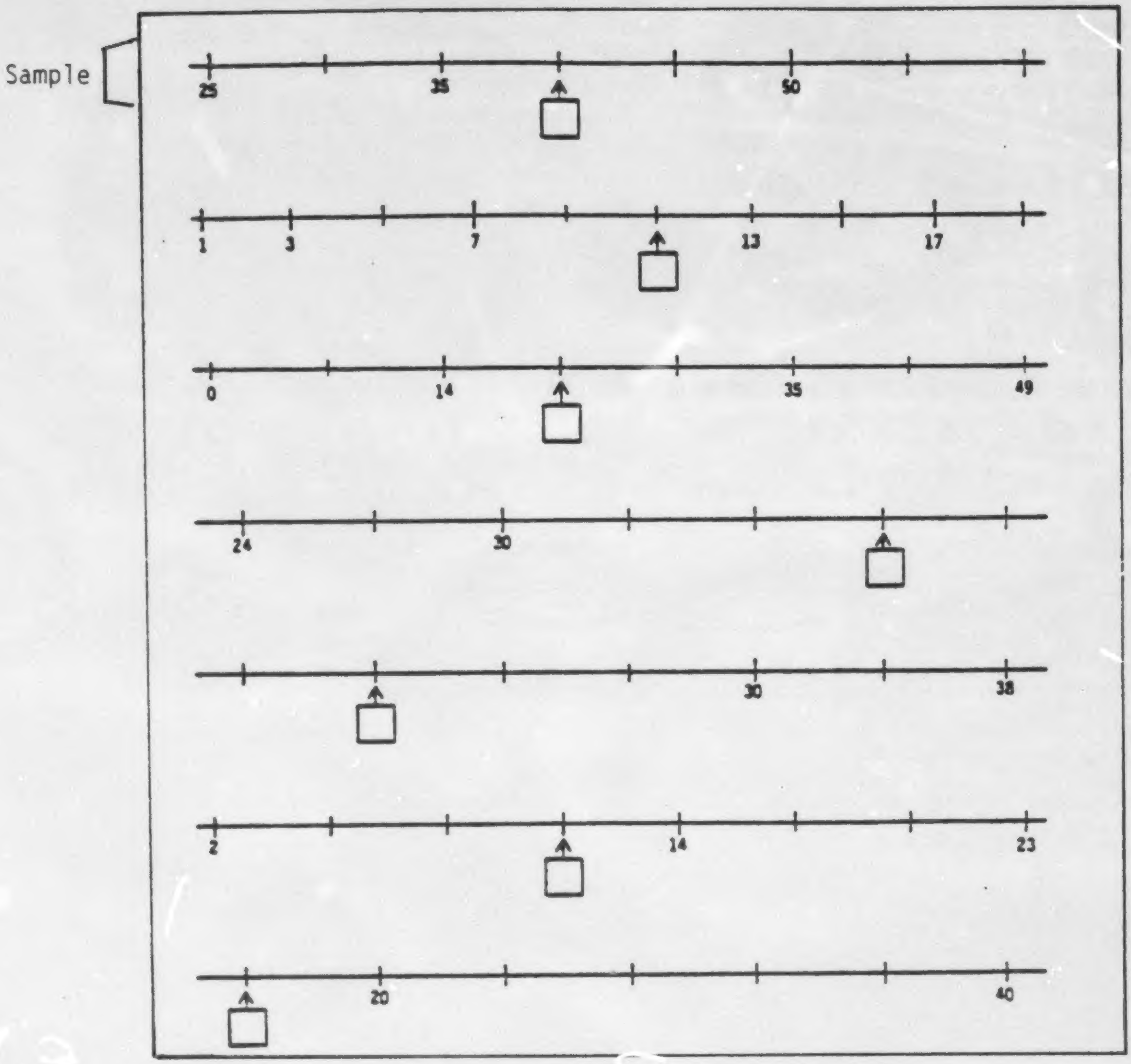
• • •				2	4	8		32	• • •

• • •	2		18	• • •

General Goal: Determine the "multiplicative" relationship in a given series of numbers and continue the series in both directions.

(R5) Labelling Number Lines

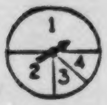
Abstract: Same basic idea as R4 only with an additive series in number line context, 6 number lines, 6 items.


Sample
25
35
50
1
3
7
13
17
0
14
35
49
24
30
30
38
2
14
23
20
40

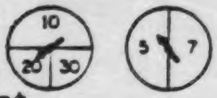
General Goal: Solve a number pattern (additive) for which only partial information is given.

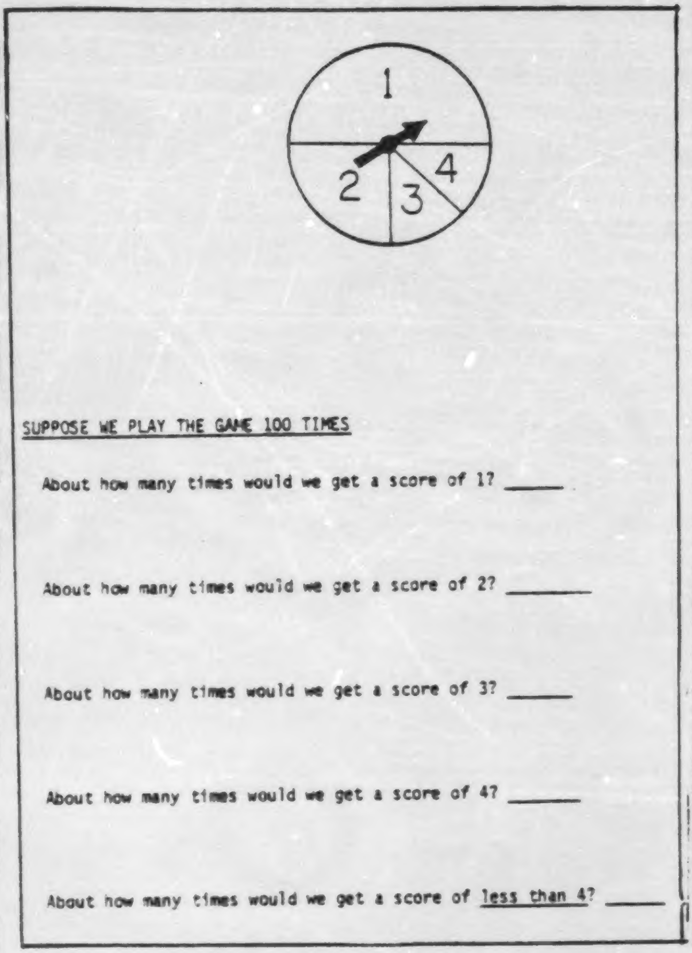
(P1) Spinners

Abstract: On page one, one spinner is shown, and one imagines it being spun 100 times. Then a series of five questions are asked: "about how many times would we get a score of ______?"



On page two, two spinners are shown, with a similar circumstance imagined and a similar 5 questions asked except that the score of the two spinners are to be added. Maximum score is 19 due to credit for relatively correct answers.





SUPPOSE WE PLAY THE GAME 100 TIMES

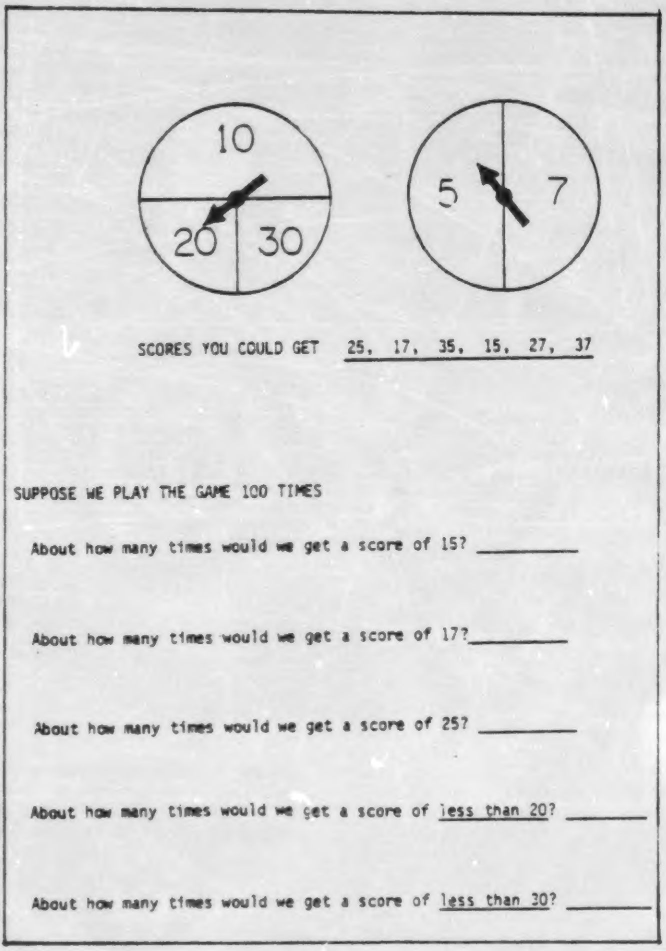
About how many times would we get a score of 1? _____

About how many times would we get a score of 2? _______

About how many times would we get a score of 3? ______

About how many times would we get a score of 4? ______

About how many times would we get a score of less than 4? _____



SCORES YOU COULD GET 25, 17, 35, 15, 27, 37

SUPPOSE WE PLAY THE GAME 100 TIMES

About how many times would we get a score of 15? _________

About how many times would we get a score of 17? _________

About how many times would we get a score of 25? _________

About how many times would we get a score of less than 20? _______

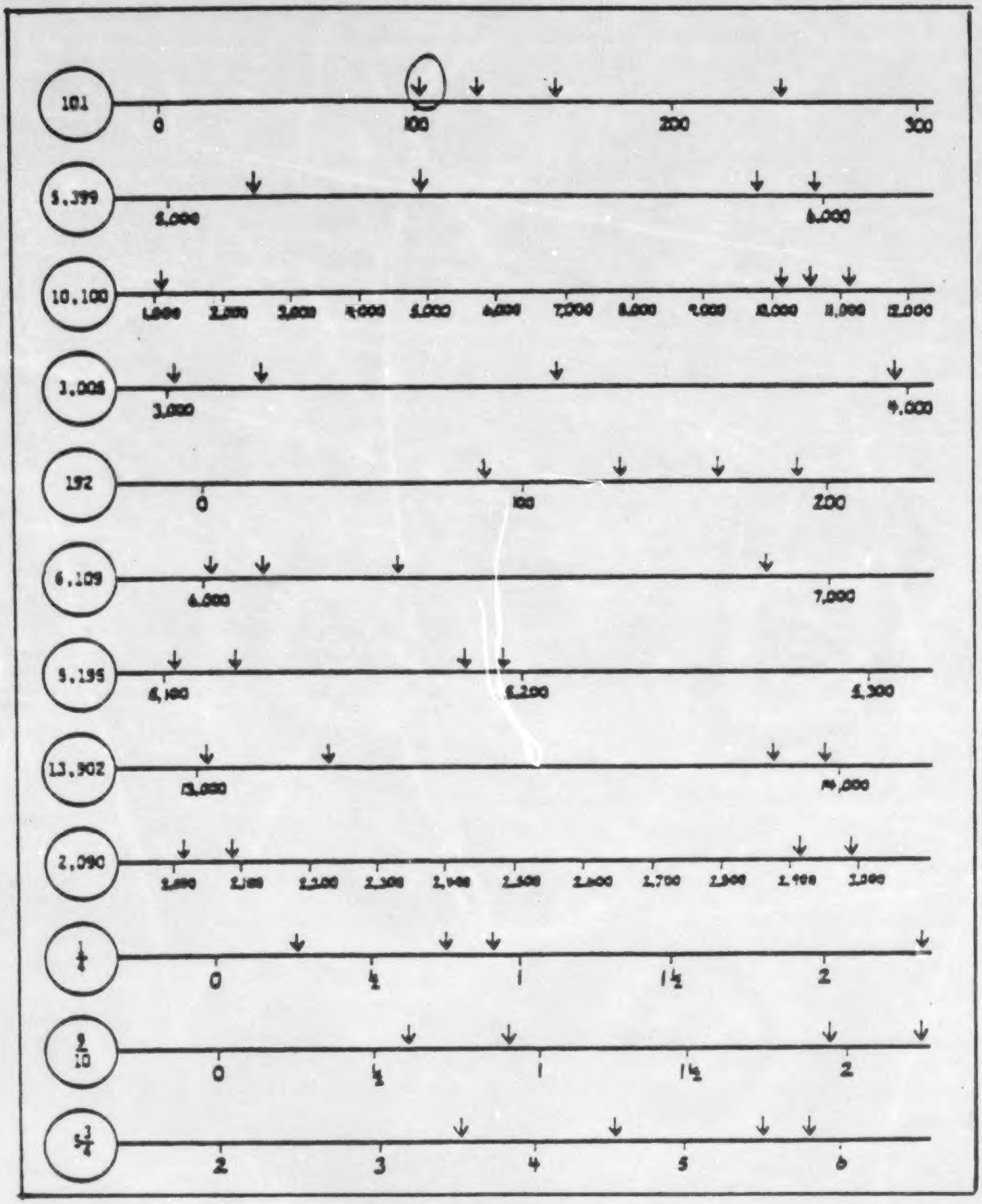
About how many times would we get a score of less than 30? _______

Directions: We play a game by spinning the spinner.
On the second page, we spin both spinners at the same time, and the score is the total from the two spinners.

General Goal: Use elementary ideas in probability to estimate how frequently various results will occur.

(V1) Arrowed Number Lines

Abstract: Given a segment of a number line with four little arrows pointing to four different points, circle the arrow pointing closest to a given number, 11 items.



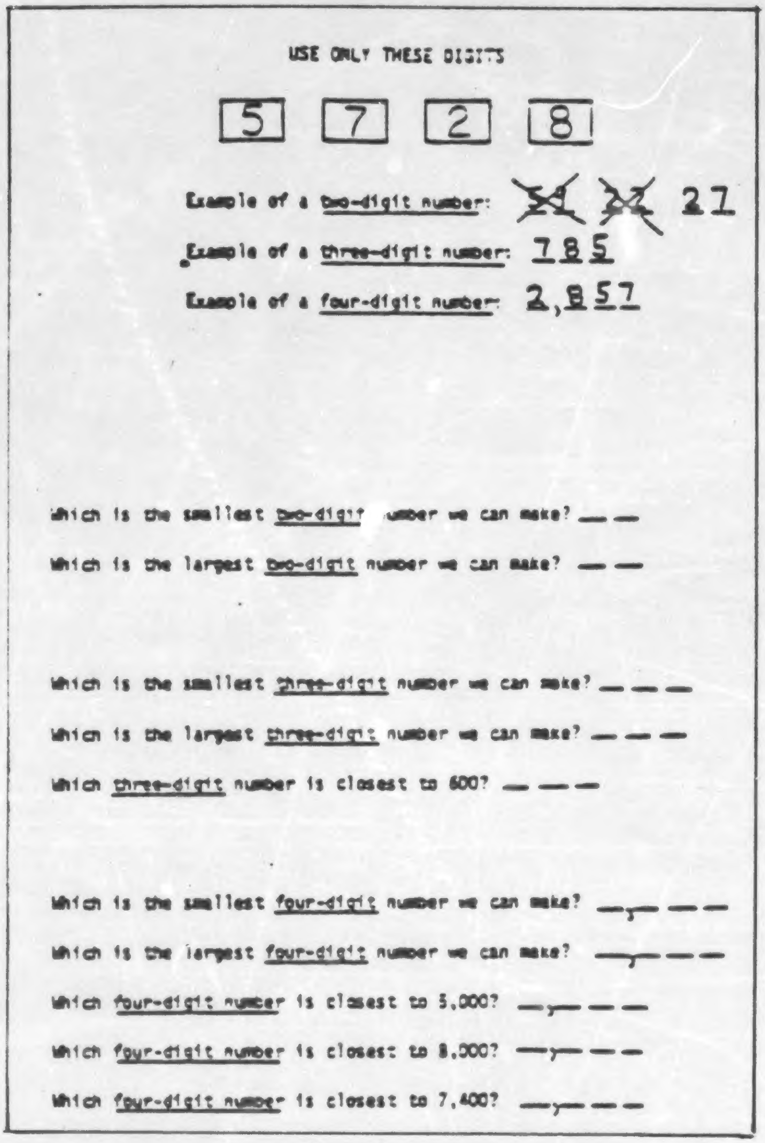
101
0
100
200
300
5,399
5,000
6,000
10,100
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
11,000
12,000
3,005
3,000
4,000
192
0
100
200
6,109
6,000
7,000
5,195
5,100
5,200
5,300
13,902
13,000
14,000
2,090
2,000
2,100
2,200
2,300
2,400
2,500
2,600
2,700
2,800
2,900
3,000
$\frac{1}{4}$
0
$\frac{1}{2}$
1
$1\frac{1}{2}$
2
$\frac{9}{10}$
0
$\frac{1}{2}$
1
$1\frac{1}{2}$
2
$5\frac{3}{4}$
2
3
4
5
6

Directions: Circle the "best" arrow for the given number. The first one is done as a sample.

General Goal: Use place value concepts to estimate the magnitude of a number relative to round numbers of a similar order of magnitude.

(V2) Constructing Numbers

Abstract: Given four different digits, and examples of legal and illegal 2, 3 and 4 digit numbers, construct a two, three or four digit number. The constructed number is either the largest, the smallest or the closest to a given number, 10 items.



USE ONLY THESE DIGITS

5 7 2 8

Example of a two-digit number: ~~54~~ ~~22~~ 27

Example of a three-digit number: 785

Example of a four-digit number: 2,857

Which is the smallest two-digit number we can make? __ __

Which is the largest two-digit number we can make? __ __

Which is the smallest three-digit number we can make? __ __ __

Which is the largest three-digit number we can make? __ __ __

Which three-digit number is closest to 600? __ __ __

Which is the smallest four-digit number we can make? __,__ __ __

Which is the largest four-digit number we can make? __,__ __ __

Which four-digit number is closest to 5,000? __,__ __ __

Which four-digit number is closest to 8,000? __,__ __ __

Which four-digit number is closest to 7,400? __,__ __ __

Directions: A digit can never be used more than once for the same number.

General Goal: Use concepts of place value to produce numbers which satisfy various conditions.

(W1) Extraneous Data (taken with W2)

Abstract: Student must read a 4 or 5 sentence word problem, disregard one or two pieces of extraneous information and then complete the one step solution involving small whole numbers, 7 items.

1. A belt costs $4.
A shirt costs $5.
A hat costs $10.
How much more does a hat cost than a belt? __________

2. Bill gave 80¢ to his sister.
He now has 60¢.
Pencils cost 10¢ each.
How many pencils can he buy? __________

3. Joe started with 40 marbles.
Marbles cost 3¢ each.
His father gave him 4 more.
Then his mother gave him 5 more.
How many marbles did he have then? __________

4. Yesterday Ann bought 3 books.
Books cost 20¢ each.
Ann has 30¢ left.
She wants to buy a game that costs 45¢.
How much more money does she need to buy the game? __________

5. There are 32 tablespoons in a pint.
There are 2 pints in a quart.
There are 4 quarts in a gallon.
How many pints are in 5 quarts? __________

6. Sue has 12 bottles.
It takes 36 bottles to fill a case.
It takes 6 bottles to fill a carton.
How many cartons can Sue fill? __________

7. Peter has $10.
He needs 4 pounds of candy.
Candy is $2 per pound.
He is buying candy for 6 people.
How much will the candy cost altogether? __________

8. Joel had 20 seeds for his pet birds.
He gave each bird the same number of seeds.
There were no seeds left over.
How many pet birds did Joel have?
Give all the possible answers __________

General Goal: Solve word problems with extraneous information which require low levels of computation.

(W2) Two-Stage (taken with W1)

Abstract: Student must read a 2 to 4 sentence word problem and complete a solution involving two different operations, 7 items.

1. Shirts cost $10 each and ties cost $5 each.
Peter bought 2 shirts and 3 ties.
What was his total cost? ____________

2. Joan starts with $40.
Each week she spends $2.
How much will she have left after 5 weeks? ________

3. The cost of gum is 3 pieces for 10¢.
How many pieces can we buy for 40¢? __________

4. Pam gets 50¢ each week.
She always spends 30¢ and saves the rest.
How much will she save in 4 weeks? ________

5. On Saturday Amy and Susan made $13 selling lemonade.
On Sunday they made $5.
They put their money together and divided it evenly.
How much did each girl get? ____________

6. Jim has $10 in his bank now.
Each week he will add $5 to his bank.
In how many weeks will he have $30 in his bank? __________

7. John has 5¢ more than Tom.
Ann has 3¢ less than Tom.
If John has 20¢, how much does Ann have? ______________

General Goal: Solve word problems involving two steps which require low levels of computation.

Appendix B

Scale-by-Scale Statistical Analysis

This Appendix contains information on each MANS scale. There are usually two pages for each scale.[1] The left hand page provides numerical data, especially item analyses, based on a summary across students. The right hand page is a graph showing mean scores of each class. The scales appear in alphabetical order by scale category as shown below:

Attitudes Items
Computation Scales (C1-C6)
Estimation (E1-E5)
Geometry (G1)
Other Number Systems (N1-N3)
Probability (P1)
Number Relations (R1)
Place Value (V1-V2)
Word Problems (W1-W2)

Beginning on page B59 graphs of class means are presented by Scale Categories; i.e. the sum of the scores of the scales in a given category.

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[1] Exceptions are the attitude items, where only item statistics are given, and some of the Computation scales.

Left Hand Pages

Test Items	Percent Correct	
	CSMP	Non-CSMP
①	②	
Number of Students	③	
KR 20 Reliability Homogeneity	④	
Correlation with Kuhlmann-Anderson	⑤	
Mean raw score " "	⑥	

⑦ Mean Ability Level:

	1	2	3	4	All	sd
CSMP						
Non-CSMP						

1 The test items listed here are shown in a greatly compressed and sometimes altered form so that what required a full page on the student copy of the test can be sqeezed into this space. Appendix B shows the actual student pages and abbreviated directions.

2 These are the percentages of students getting the item correct.

3 The number of CSMP students will usually be about 650 except when the scale was taken by a random half of each class. For non-CSMP, it is usually about 450.

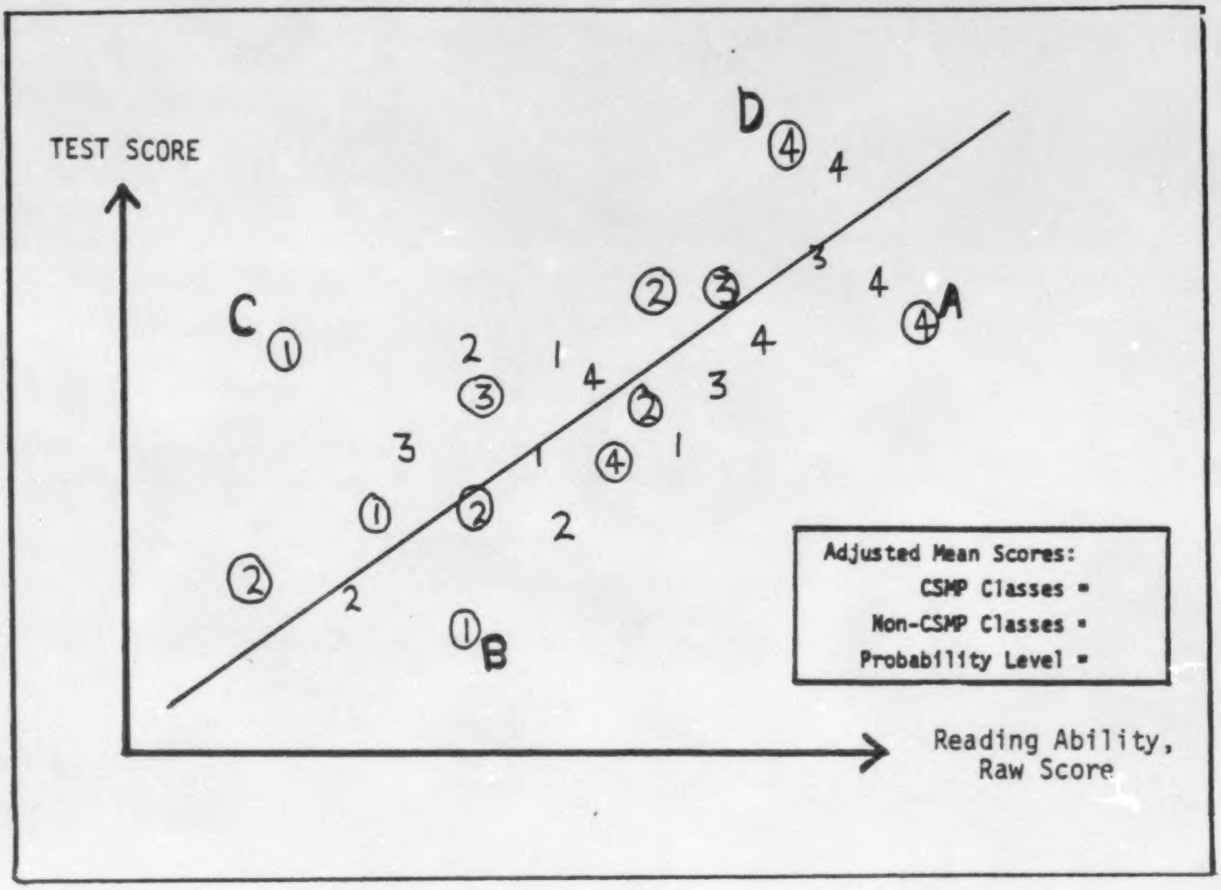
4 The KR 20 reliability coefficient is a measure of the degree to which the items in a scale are testing a single underlying ability. A large KR 20 (above say, .8) means a high correlation among the items; a low KR 20 (below say .5) means a low correlation among the items and not a single underlying ability.

5 The mean raw score on the SAT Reading Test for those students who took this particular scale.

6 Further correlation data is given on page 41.

7 The mean score on the scale was calculated separately for all students whose reading score corresponded to a percentile rank of 20 or less (Q1). The same procedure was followed for percentile ranks 20-39 (Q2), 40-59 (Q3), 60-79 (Q4) and 80-99 (Q5). This table reports the mean scores for these various quintiles, and combined, for CSMP and for non-CSMP students. The lowest line of the table gives the difference in means (CSMP minus non-CSMP) divided by the pooled standard deviation. This is a t-statistic, so that a rough rule of thumb would be to consider values of this ration above 2 to be significant. This is aggregation by students rather than classes, so this is a much more liberal test of differences.

Right Hand Pages



The right hand pages are for the graphs of class means. Each CSMP class is represented by a numeral, which stands for the site in which the class is located. For CSMP classes the numerals are circled; for non-CSMP classes they are plain. Based on this set of class means thus graphed, the regression line has been drawn. This line is the best linear prediction of mean class test score that can be made from knowing the ability level of the class. Note in the example that classes A and B fall well below the regression line, or are scoring well below what would be predicted for them knowing the ability level of the class, while classes C and D fall well above the regression line. Note also that, although class A had a slightly higher mean score on the test than did class C, class C did much better given relative ability scores of the two classes. When the class means generally fall close to the regression line, test scores are well predicted by the covariate; when they are more dispersed from this line, the covariate is a less effective predictor.

In the box in the lower right hand corner, the mean scores across CSMP and across non-CSMP classes, adjusted for reading ability, are also given, together with the p-value obtained from the F-test. (The p-value is the probability that a difference in mean scores that large could have occurred by chance alone. Hence, the smaller the p-value (especially below, say, .05), the more likely it is that there are "real" differences between CSMP and non-CSMP classes).

A1, Attitude Towards School Subjects[1]

"For each subject, put an "x" in the circle that describes how you feel."

	Like	In between	Do not like	NAEP Percentages[1]		
A. Science	%CSMP = 49 ○ % Non-CSMP = 53	42 ○ 37	9 ○ 9	54	35	9
B. Social Studies (History)	41 ○ 37	42 ○ 42	16 ○ 20	42	34	21
C. Mathematics	58 ○ 57	29 ○ 30	12 ○ 12	65	21	11
D. Reading	56 ○ 59	33 ○ 31	10 ○ 9	62	24	12
E. Spelling	56 ○ 62	34 ○ 28	10 ○ 10	57	30	12
F. Physical Ed (P.E. or Gym)	83 ○ 83	12 ○ 12	4 ○ 4	82	10	6

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[1] These items, and those on the following three scales, were part of a much larger set of items used by the National Assessment of Educational Progress which are described in the Second Assessment of Mathematics, 1977-78, Released Exercise Set, May 1979. Permission was granted by NAEP for the use of these items in this study. The NAEP percentages are based on their national sample of 9-year olds (predominantly fourth graders), administered in 1978.

A2, Time Spent on Math Activities

"On this page, you have to tell how often you have done these activities this year in learning mathematics..."

		A lot	A little	Never	NAEP Percentages		
A.	Taken mathematics tests	% CSMP = 34 ○ % Non-CSMP = 47	63 ○ 50	2 ○ 2	44	46	9
B.	Done mathematics homework	37 ○ 57	48 ○ 34	14 ○ 8	43	45	12
C.	Helped a classmate do mathematics	20 ○ 15	59 ○ 66	20 ○ 18	14	56	29
D.	Played mathematics games	48 ○ 18	48 ○ 63	4 ○ 19	31	55	14
E.	Listened to the teacher explain a mathematics lesson	85 ○ 83	13 ○ 15	1 ○ 2	85	11	3
F.	Gotten individual help from the teacher on your mathematics	18 ○ 20	70 ○ 67	11 ○ 12	21	67	11
G.	Worked mathematics problems at the board	41 ○ 40	55 ○ 54	4 ○ 6	39	54	7
H.	Worked mathematics problems in small groups	7 ○ 9	47 ○ 36	45 ○ 54	16	49	35
I.	Worked mathematics problems alone.	81 ○ 81	16 ○ 14	2 ○ 4	71	22	7
J.	Done work sheets	87 ○ 68	12 ○ 28	0 ○ 4	71	27	2

A3, Self Concept and Mathematics

"On this page you have to tell how you feel about each of these statements about mathematics . . ."

NAEP Percentages

A. I usually understand what we are talking about in mathematics.

True about me
% CSMP = 49 ○ % Non-CSMP = 46

Sometimes true about me
50 ○ 51

Not true about me
1 ○ 2

NAEP: 39 57 4

B. Doing mathematics makes me nervous.

True about me
10 ○ 11

Sometimes true about me
24 ○ 28

Not true about me
65 ○ 60

NAEP: 21 30 48

C. Mathematics is fun for me.

True about me
47 ○ 51

Sometimes true about me
39 ○ 34

Not true about me
14 ○ 15

NAEP: 45 46 8

D. I really want to do well in mathematics.

True about me
91 ○ 91

Sometimes true about me
7 ○ 7

Not true about me
2 ○ 2

NAEP: 79 19 2

E. Mathematics is boring for me.

True about me
10 ○ 12

Sometimes true about me
38 ○ 31

Not true about me
52 ○ 57

NAEP: 17 31 52

A4, Attitude Towards Math Activities

"On this page you have to tell how you feel about each of these activities in learning mathematics . . ."

NAEP Percentages

A. Playing mathematics games

I like it a lot	I like it a little	I don't like it	NAEP Percentages		
% CSMP = 72 ○ % Non-CSMP = 69	26 ○ 28	2 ○ 2	77	18	4

B. Listening to the teacher explain a mathematics lesson

I like it a lot	I like it a little	I don't like it	NAEP Percentages		
35 ○ 36	51 ○ 51	14 ○ 13	50	40	9

C. Getting individual help from the teacher on your mathematics

I like it a lot	I like it a little	I don't like it	NAEP Percentages		
31 ○ 33	50 ○ 47	19 ○ 19	61	31	7

D. Working mathematics problems in small groups

I like it a lot	I like it a little	I don't like it	NAEP Percentages		
34 ○ 31	40 ○ 38	26 ○ 31	53	41	5

E. Working mathematics problems alone.

I like it a lot	I like it a little	I don't like it	NAEP Percentages		
57 ○ 59	31 ○ 30	11 ○ 11	50	38	11

F. Doing work sheets

I like it a lot	I like it a little	I don't like it	NAEP Percentages		
44 ○ 45	41 ○ 38	15 ○ 17	51	37	9

C1: Stanford Achievement Test, Computation Test, Intermediate Level 1, Form A
(Total of 40 items)

First Alternate Form (20 items), taken by a random half of the students in each class.

	CSMP	Non-CSMP
Mean Score, C1	11.8	12.1
Standard Deviation	3.9	4.5
Number of Students	337	236
KR20 Reliability/Homogeneity	.77	.83
Mean Reading Score	16.8	16.0
Correlation of Scale and Reading Scores	.42	.61

Second Alternate Form (20 items), taken by the other random half of the students in each class

	CSMP	Non-CSMP
Mean Score, C1	11.7	12.9
Standard Deviation	4.0	4.4
Number of Students	315	237
KR20 Reliability/Homogeneity	.77	.82
Mean Reading Score	17.8	17.5
Correlation of Scale and Reading Scores	.53	.48

Total of 2 Alternate Forms of C1:

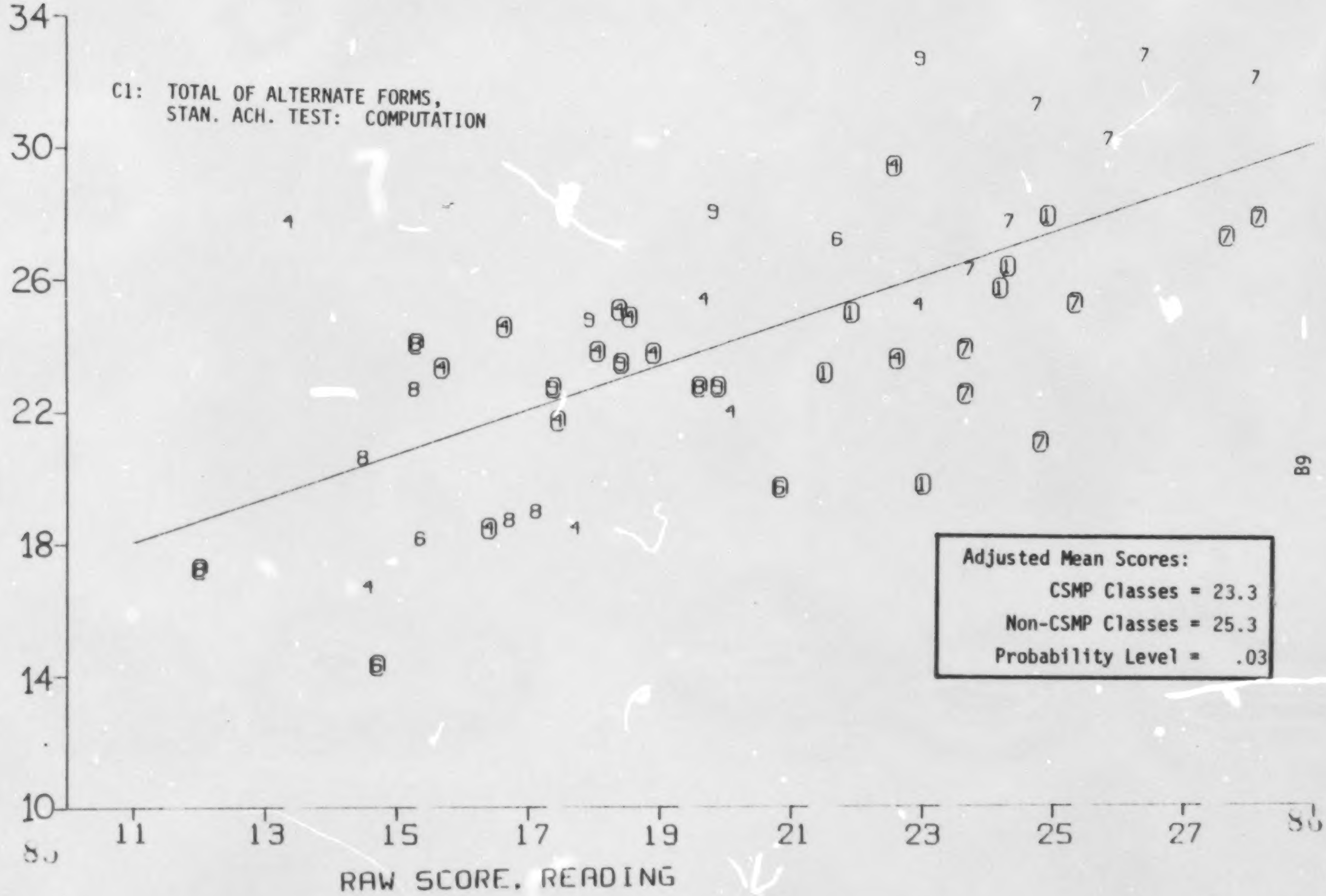
Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	8.7	9.2	11.1	12.2	13.9	11.7
Non-CSMP ($\overline{X}_2$)	8.7	10.3	10.7	13.4	15.4	12.5
($\overline{X}_1-\overline{X}_2$)/sd	0.0	-1.8	0.6	-2.9	-4.3	-4.1

Notes: Licensing agreements with the Psychological Corporation do not allow reproduction here of the test items. Altogether there were 40 items. 18 of the following type

56 ÷ 8 ● 54 ÷ 6 > = <

where the student was required to circle the sign which should replace ●. The other 22 items were multiple choice items dealing with whole number computation, including 2 x 3 digit multiplication and 3 x 1 digit division with remainder. For an anlysis of responses by item type and operation, see page 35.



C1: TOTAL OF ALTERNATE FORMS,
STAN. ACH. TEST: COMPUTATION

Adjusted Mean Scores:
CSMP Classes = 23.3
Non-CSMP Classes = 25.3
Probability Level = .03

C2 - Fractions (First Alternate Form)

Test Items	Percent Correct	
	CSMP	Non-CSMP
> is greater than = is equal to < is less than		
3×162 ● 4×160 > = <	61	64
$6{,}000 \div 78$ ● $6{,}000 \div 79$ > = <	56	46
$\frac{3}{8}$ ● $\frac{3}{4}$ > = <	43	33
$\frac{1}{2} + \frac{1}{2} =$ a $\frac{1}{4}$ b $\frac{2}{4}$ c 1 d $2\frac{1}{2}$ e NH	46	35
$8\frac{1}{3} - 5 =$ a $\frac{1}{3}$ b $3\frac{1}{3}$ c $5\frac{1}{3}$ d $3\frac{2}{3}$ e NH	60	50
$\frac{1}{2}$ of $\boxed{}$ = 8 a 4 b $8\frac{1}{2}$ c 10 d 16 e NH	60	35
Number of Students	337	236
KR20 Reliability/Homogeneity	.61	.59
Mean Reading Score	16.8	16.0
Correlation of Scale and Reading Scores	.44	.53

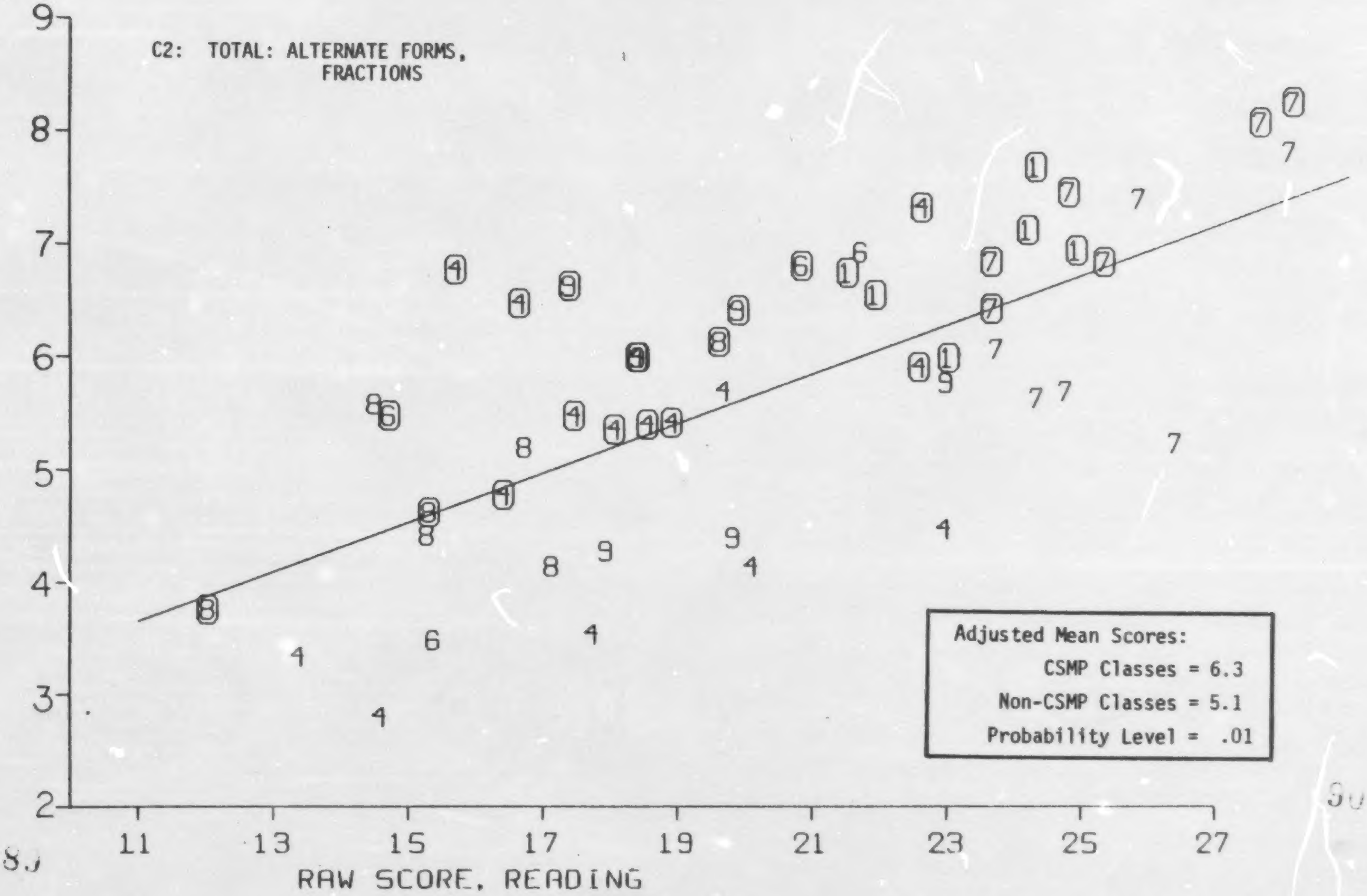
C2 - Fractions (Second Alternate Form)

Test Items	Percent Correct	
	CSMP	Non-CSMP
> is greater than = is equal to < is less than		
25,000 ÷ 31 ● 26,000 ÷ 31 > = <	64	65
800 ÷ 3 ● 900 ÷ 31 > = <	57	46
$\frac{1}{3}$ ● $\frac{4}{12}$ > = <	27	24
$\frac{1}{2}$ of 230 = a 115 b 130 c 215 d 460 e NH	69	48
$\frac{3}{5} - \frac{1}{5}$ = a $\frac{2}{5}$ b $\frac{4}{5}$ c $\frac{2}{10}$ d $\frac{2}{0}$ e NH	47	55
$\frac{1}{3}$ of ☐ = 12 a 4 b $12\frac{1}{3}$ c 18 d 36 e NH	37	15
Number of Students	315	237
KR20 Reliability/Homogeneity	.58	.53
Mean Reading Score	17.8	17.5
Correlation of Scale and Reading Scores	.46	.39

Total of 2 Alternate Forms of C2:

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	2.2	2.1	2.7	3.3	4.0	3.1
Non-CSMP ($\overline{X}_2$)	1.7	1.8	2.0	2.9	3.4	2.6
($\overline{X}_1$-$\overline{X}_2$)/sd	1.8	1.4	3.6	2.2	3.4	5.6



C2: TOTAL: ALTERNATE FORMS, FRACTIONS

Adjusted Mean Scores:
CSMP Classes = 6.3
Non-CSMP Classes = 5.1
Probability Level = .01

B13

C3 - Mental Arithmetic, Addition

Test Items	Percent Correct CSMP	Percent Correct Non-CSMP
53 + 8 = ☐	90	87
3,009 + 3,001 + 3,001 = ☐	65	57
542 + 99 = ☐	69	66
☐ + 125 = 250	77	66
989 + ☐ = 1,000	72	46
Number of Students	337	236
KR20 Reliability/Homogeneity	.45	.57
Mean Reading Score	16.8	16.0
Correlation of Scale and Reading Scores	.30	.49

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	3.3	3.3	3.5	4.0	4.1	3.7
Non-CSMP ($\bar{X}_2$)	1.9	2.9	2.7	3.6	3.9	3.2
$(\bar{X}_1-\bar{X}_2)/sd$	3.3	1.7	3.6	1.5	0.7	4.8

C4 - Mental Arithmetic, Subtraction

Test Items	Percent Correct	
	CSMP	Non-CSMP
72 − 4 = ☐	86	87
1,000 − 5 = ☐	70	59
700 − 401 = ☐	46	44
525 − ☐ = 225	71	57
☐ - 250 = 150	22	19
Number of Students	315	237
KR20 Reliability/Homogeneity	.54	.54
Mean Reading Score	17.8	17.5
Correlation of Scale and Reading Scores	.44	.29

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	2.0	2.4	2.5	3.3	3.6	3.0
Non-CSMP ($\overline{X}_2$)	2.2	2.2	2.2	2.9	3.1	2.7
$(\overline{X}_1-\overline{X}_2)/sd$	-0.3	0.6	1.2	1.7	2.5	2.4

C5 - Mental Arithmetic, Multiplication

Test Items	Percent Correct CSMP	Percent Correct Non-CSMP
7 x 3 = ☐	97	93
7 x 30 = ☐	77	81
3 x 125 = ☐	78	65
12 x 500 = ☐	43	37
99 x 8 = ☐	33	44
☐ x 4 = 400	70	70
200 x ☐ = 800	53	38
☐ x 250 = 500	53	41
Number of Students	315	237
KR20 Reliability/Homogeneity	.69	.73
Mean Reading Score	17.8	17.5
Correlation of Scale and Reading Scores	.52	.40

Means by Ability Level

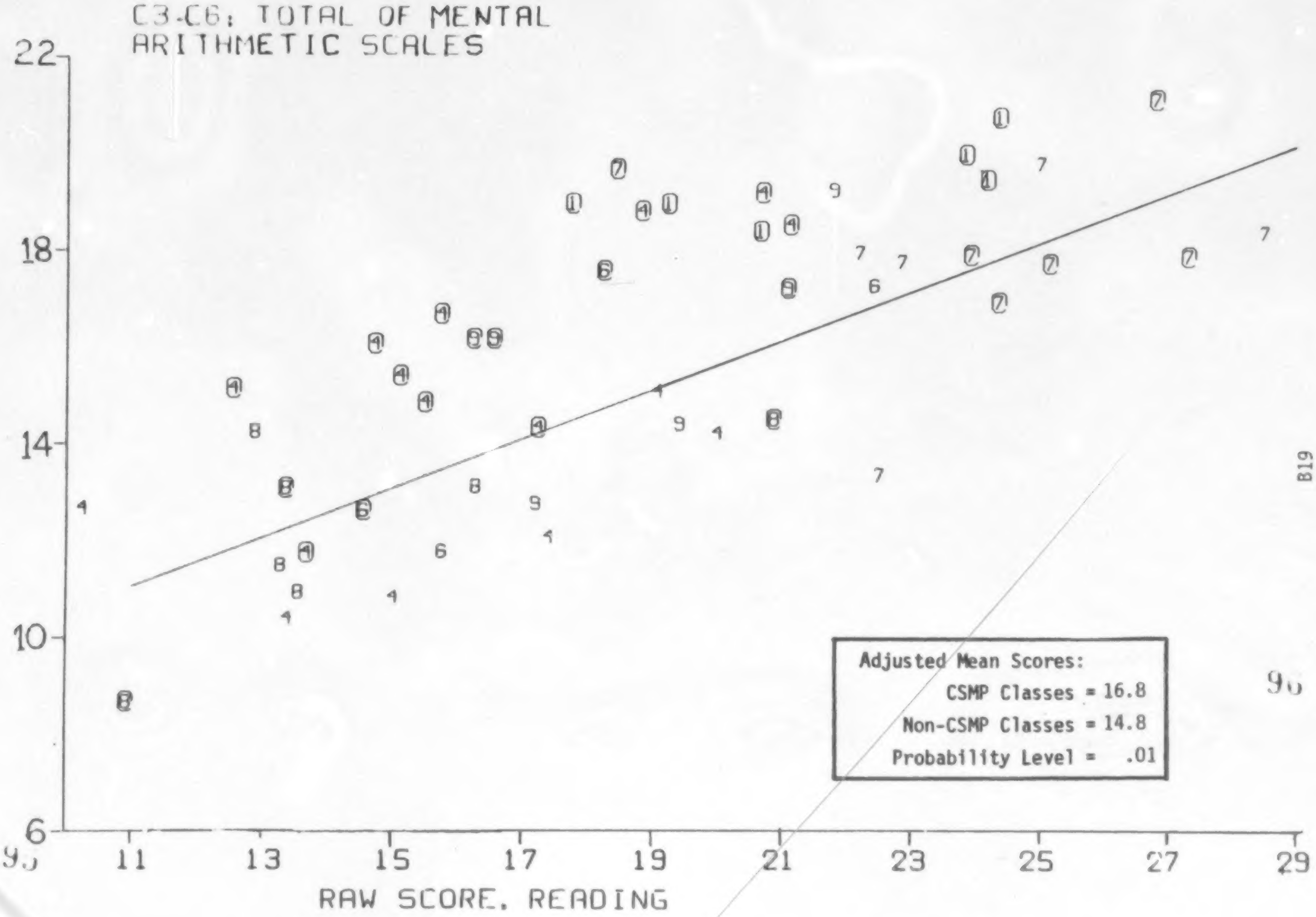
	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	3.5	3.8	4.6	5.2	6.4	5.1
Non-CSMP ($\bar{X}_2$)	3.5	3.8	3.9	5.3	5.6	4.7
($\bar{X}_1$-$\bar{X}_2$)/sd	0.0	0.0	2.3	-0.3	3.3	2.4

C6 – Mental Arithmetic, Division

Test Items	Percent Correct	
	CSMP	Non-CSMP
21 DIVIDED BY 3 = ☐	89	86
500 DIVIDED BY 2 = ☐	68	49
700 DIVIDED BY 10 = ☐	73	60
300 DIVIDED BY 50 = ☐	58	53
150 DIVIDED BY 25 = ☐	54	48
800 DIVIDED BY ☐ = 200	52	39
☐ DIVIDED BY 3 = 120	46	19
600 DIVIDED BY ☐ = 2	60	52
Number of Students	337	236
KR20 Reliability/Homogeneity	.80	.80
Mean Reading Score	16.8	16.0
Correlation of Scale and Reading Scores	.50	.50

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	3.8	3.3	4.0	5.4	6.3	5.0
Non-CSMP ($\bar{X}_2$)	2.7	2.6	3.1	4.6	5.5	4.1
($\bar{X}_1$-$\bar{X}_2$)/sd	1.5	1.4	2.3	2.0	3.3	4.6



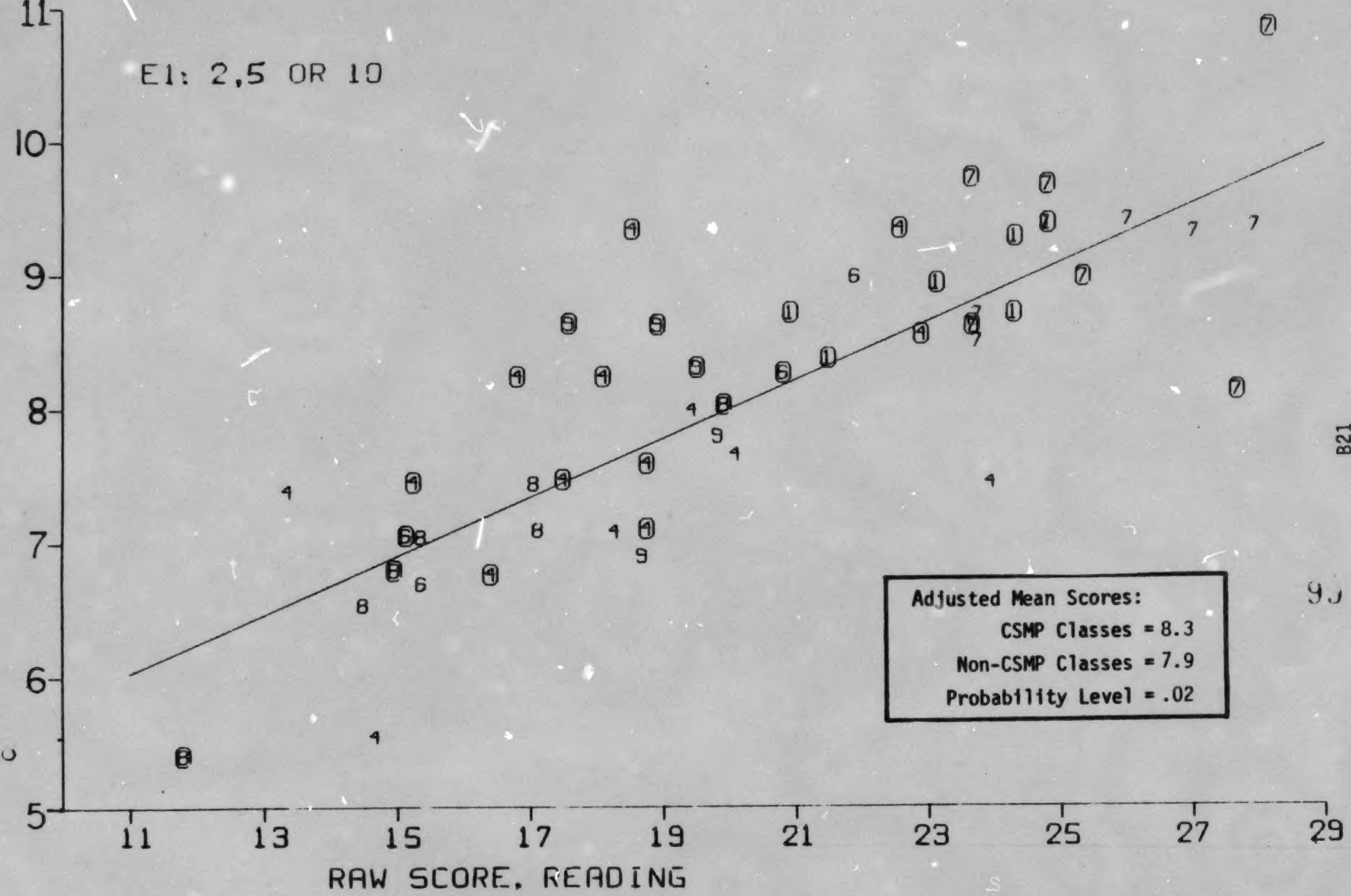
Adjusted Mean Scores:
CSMP Classes = 16.8
Non-CSMP Classes = 14.8
Probability Level = .01

E1 - Two, Five or Ten

Test Items	Percent Correct	
	CSMP	Non-CSMP
2 or 5 or 10		
150 is about _____ times as large as 7	87	76
65 is about _____ times as large as 12	85	80
299 is about _____ times as large as 21	88	86
100 is about _____ times as large as 19	60	55
98 is about _____ times as large as 50	82	76
45 is about _____ times as large as 8	84	75
602 is about _____ times as large as 298	62	57
503 is about _____ times as large as 49	69	71
59 is about _____ times as large as 29	76	75
12 is about _____ times as large as $2\frac{1}{2}$	49	50
$20\frac{1}{2}$ is about _____ times as large as $9\frac{1}{2}$	67	63
$5\frac{1}{2}$ is about _____ times as large as $\frac{1}{2}$	23	14
Number of Students	622	455
KR20 Reliability/Homogeneity	.74	.69
Mean Reading Score	17.3	16.8
Correlation of Scale and Reading Scores	.45	.45

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	6.4	6.9	7.7	8.6	9.7	8.3
Non-CSMP ($\bar{X}_2$)	6.2	6.6	6.9	8.4	9.1	7.8
$(\bar{X}_1-\bar{X}_2)/sd$	0.5	0.8	2.2	0.8	2.3	2.7



Adjusted Mean Scores:

CSMP Classes = 8.3

Non-CSMP Classes = 7.9

Probability Level = .02

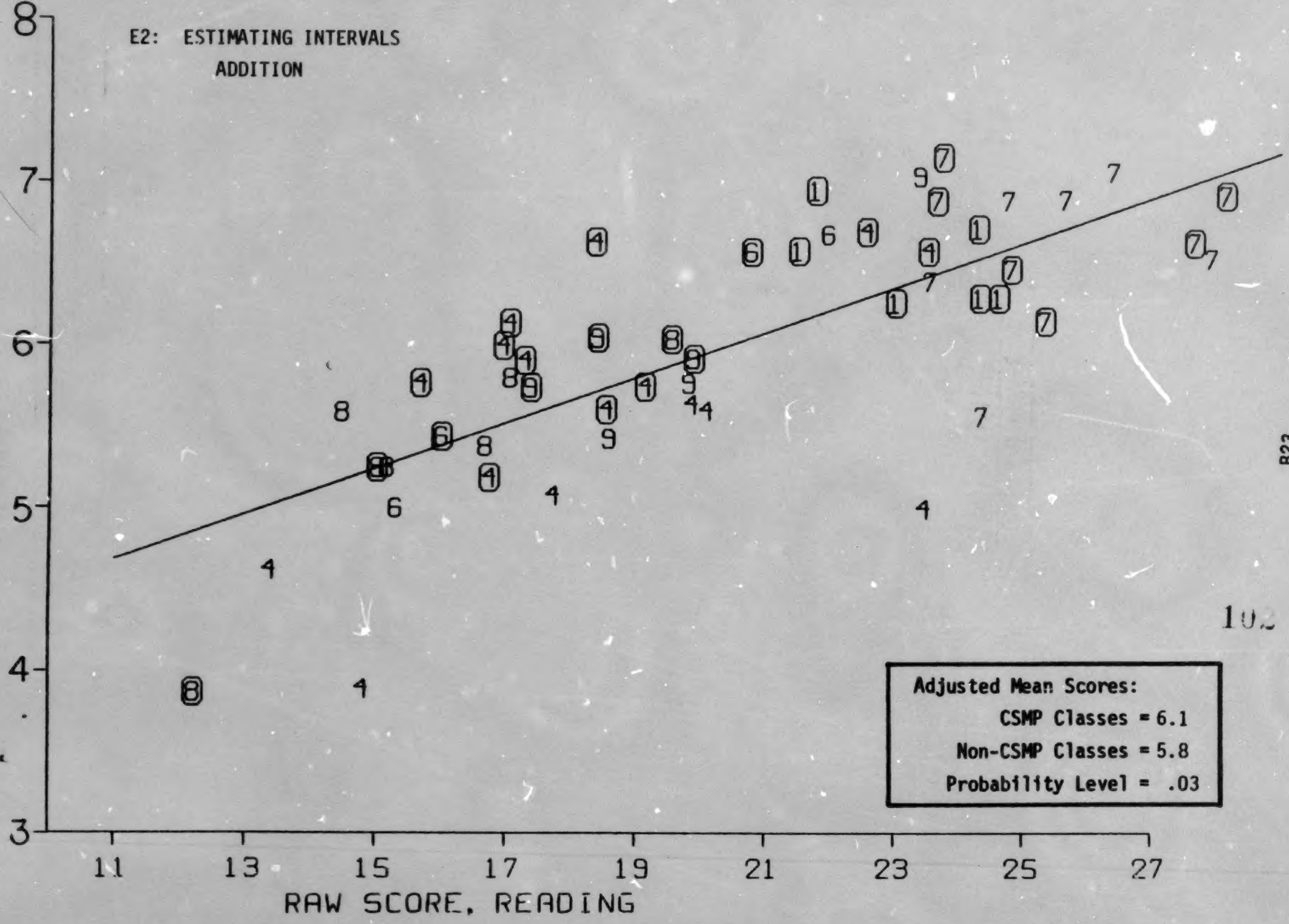
B21

E2 - Estimating Intervals, Addition

Test Items (Students put an "x" in correct interval.)							Percent Correct	
							CSMP	Non-CSMP
ADDITION								
185 + 97	0	10	50	100	500	1000	85	80
24 + 24	0	10	50	100	500	1000	87	81
59 + 39	0	10	50	100	500	1000	88	85
479 + 86	0	10	50	100	500	1000	74	71
279 + 165	0	10	50	100	500	1000	79	76
19 + 29	0	10	50	100	500	1000	78	73
257 + 294	0	10	50	100	500	1000	56	50
19 + 19 + 19	0	10	50	100	500	1000	50	49
Number of Students							627	447
KR20 Reliability/Homogeneity							.73	.73
Mean Reading Score							16.9	16.4
Correlation of Scale and Reading Scores							.47	.49

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	5.0	5.1	5.9	6.4	6.8	6.1
Non-CSMP ($\overline{X}_2$)	4.4	4.8	5.2	6.4	6.7	5.8
$(\overline{X}_1-\overline{X}_2)/sd$	1.5	1.0	2.7	0.0	0.9	2.7

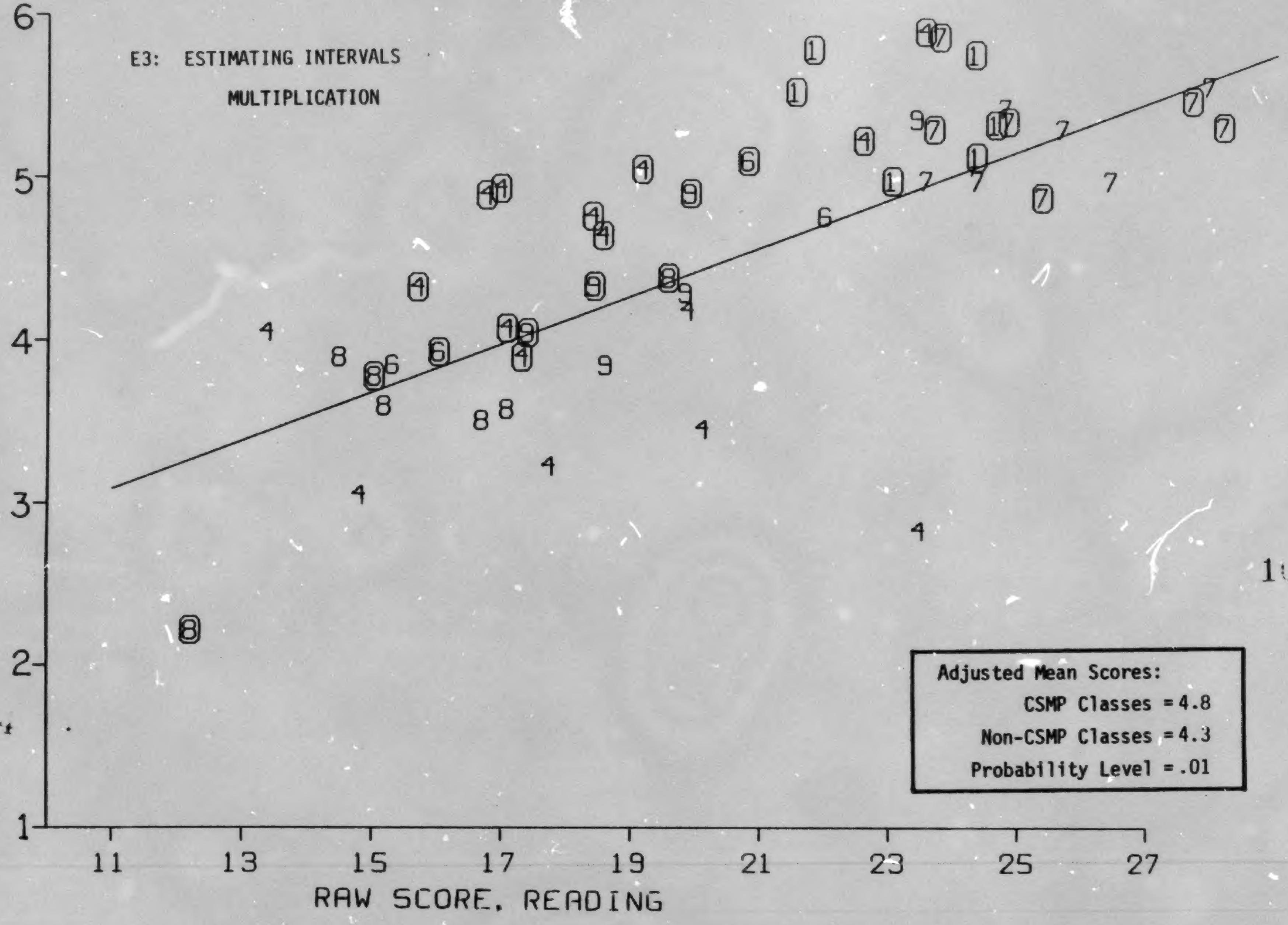

E2: ESTIMATING INTERVALS
ADDITION
8
7
6
5
4
3
11
13
15
17
19
21
23
25
27
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 6.1
Non-CSMP Classes = 5.8
Probability Level = .03
B23

E3 - Estimating Intervals, Multiplication

Test Items (Students put an "x" in correct interval.		Percent Correct	
		CSMP	Non-CSMP
MULTIPLICATION			
5 x 109	0 10 50 100 500 1000	77	67
2 x 19	0 10 50 100 500 1000	84	77
40 x 10	0 10 50 100 500 1000	73	61
4 x 23	0 10 50 100 500 1000	70	65
11 x 50	0 10 50 100 500 1000	52	40
2 x 49	0 10 50 100 500 1000	72	67
4 x 29	0 10 50 100 500 1000	40	38
	Number of Students	627	447
	KR20 Reliability/Homogeneity	.67	.65
	Mean Reading Score	16.9	16.4
	Correlation of Scale and Reading Scores	.51	.47

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	3.6	3.9	4.4	5.0	5.6	4.8
Non-CSMP ($\bar{X}_2$)	3.1	3.4	3.7	4.7	5.1	4.3
($\bar{X}_1$-$\bar{X}_2$)/sd	1.5	1.8	2.8	1.6	3.4	5.0


E3: ESTIMATING INTERVALS

MULTIPLICATION

Adjusted Mean Scores:

CSMP Classes = 4.8

Non-CSMP Classes = 4.3

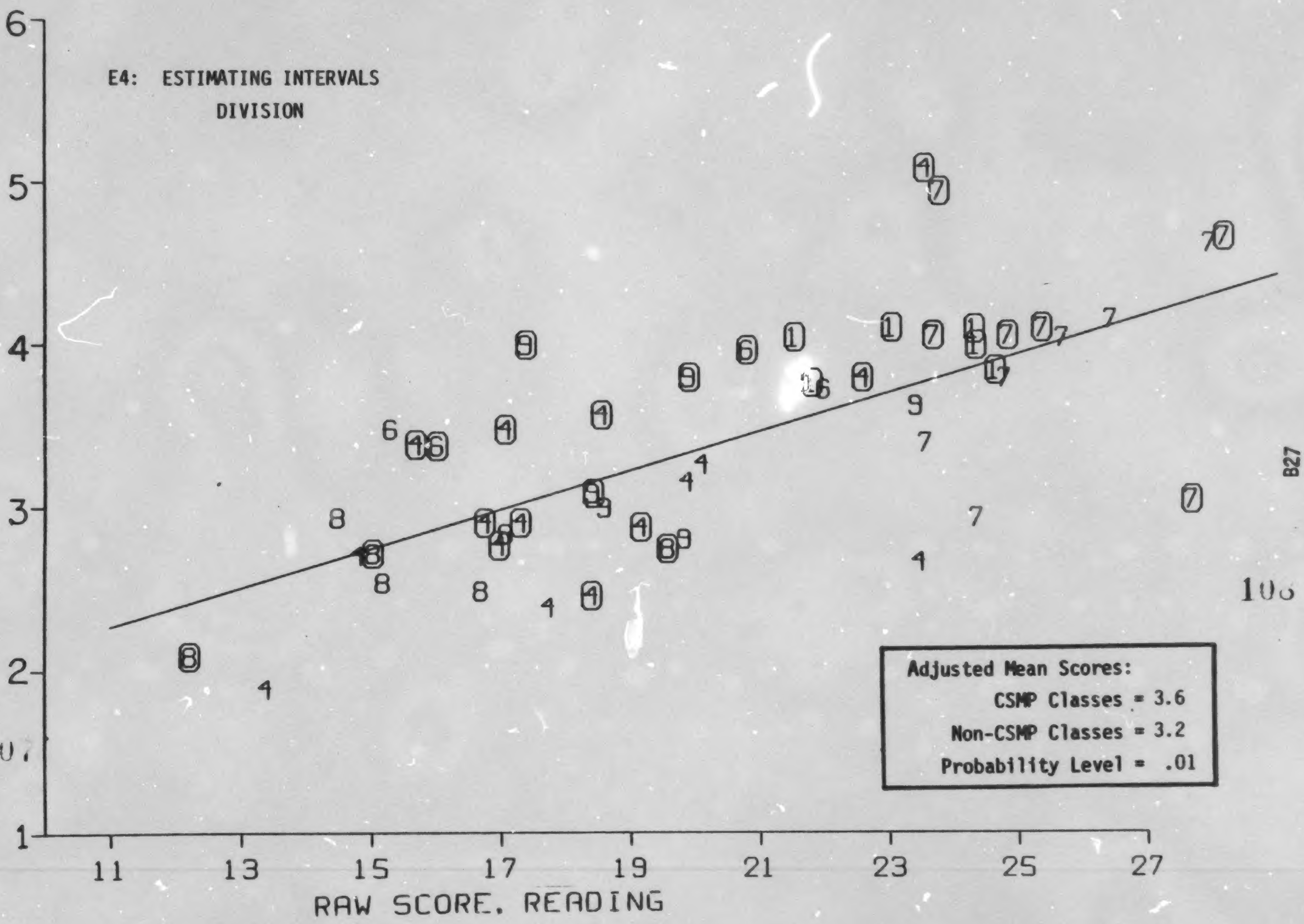
Probability Level = .01

E4 - Estimating Intervals, Division

Test Items (Students put an "x" in correct interval.)						Percent Correct	
						CSMP	Non-CSMP
DIVISION							
300 DIVIDED BY 4	0	1	10	20	100	74	70
190 DIVIDED BY 10	0	1	10	20	100	58	46
1 DIVIDED BY 2	0	1	10	20	100	55	38
101 DIVIDED BY 9	0	1	10	20	100	56	51
133 DIVIDED BY 50	0	1	10	20	100	32	32
18,230 DIVIDED BY 1,000	0	1	10	20	100	27	30
850 DIVIDED BY 101	0	1	10	20	100	23	23
180 DIVIDED BY 21	0	1	10	20	100	20	19
Number of Students						627	447
KR20 Reliability/Homogeneity						.61	.67
Mean Reading Score						16.9	16.4
Correlation of Scale and Reading Scores						.37	.38

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	2.7	2.7	3.2	3.7	4.2	3.5
Non-CSMP ($\overline{X}_2$)	2.4	2.4	2.5	3.6	3.9	3.2
($\overline{X}_1$-$\overline{X}_2$)/sd	0.8	1.0	2.8	0.6	1.2	2.9

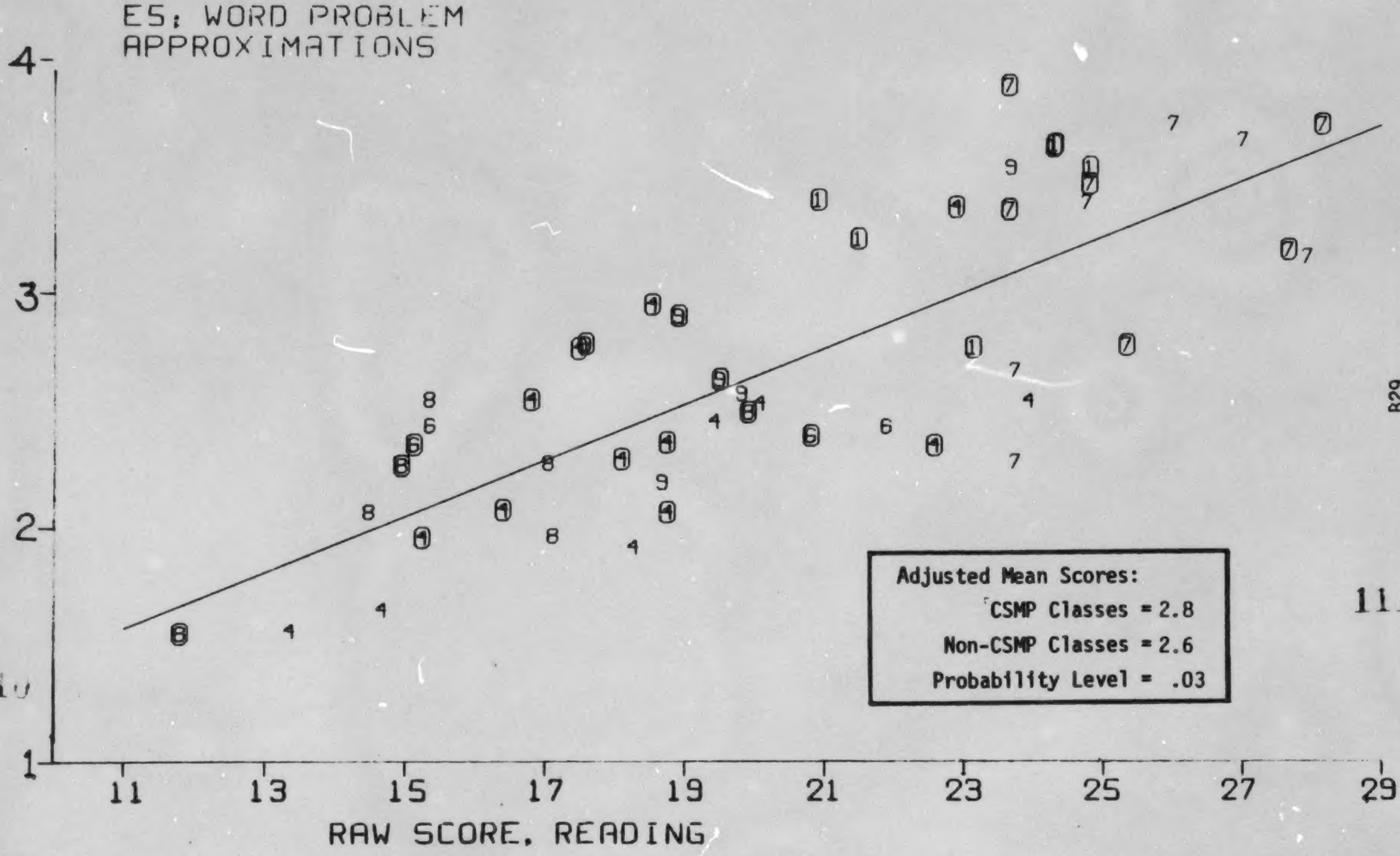
E4: ESTIMATING INTERVALS
DIVISION
6
5
4
3
2
1
11
13
15
17
19
21
23
25
27
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 3.6
Non-CSMP Classes = 3.2
Probability Level = .01

E5 - Word Problem Approximations

Test Items	Percent Correct	
	CSMP	Non-CSMP
1. George has $902. He wants to buy a piano costing $1,348. About how much more money does he need? $250 $350 $450 $550	41	38
2. Tom and Bill had a long distance race. Bill ran it in 32 minutes, 2 seconds. Tom ran it in 29 minutes, 34 seconds. About how much did Tom win by? $1\frac{1}{2}$ minutes $2\frac{1}{2}$ minutes $3\frac{1}{2}$ minutes $4\frac{1}{2}$ minutes	23	20
3. A white pine will grow to be about 100 feet tall. A blue spruce will grow to be about 30 feet tall. A white pine will grow about how many times as tall as a blue spruce? 2 times 3 times 5 times 10 times	62	50
4. Martha can walk 2 blocks in 5 minutes. About how many blocks can she walk in 13 minutes? 5 blocks 10 blocks 15 blocks 18 blocks	53	49
5. Susan has $131. Chairs cost $32. About how many chairs can Susan buy? 2 chairs 4 chairs 6 chairs 10 chairs	54	53
6. It takes 3 or 4 cups of water to cook one dozen eggs. Mary has to cook 5 dozen eggs. About how many cups of water will she need? 8 cups 12 cups 16 cups 25 cups	47	43
Number of Students	622	455
KR20 Reliability/Homogeneity	.40	.48
Mean Reading Score	17.3	16.8
Correlation of Scale and Reading Scores	.38	.37

Means by Ability Level

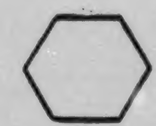
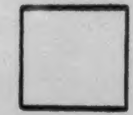
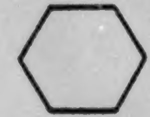
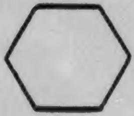
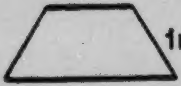
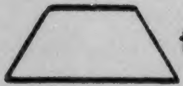
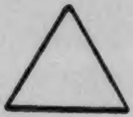
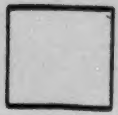
	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	2.1	2.2	2.3	2.8	3.5	2.8
Non-CSMP ($\overline{X}_2$)	1.9	1.9	2.1	2.7	3.2	2.5
$(\overline{X}_1-\overline{X}_2)/sd$	0.7	1.7	1.2	0.9	1.5	2.7


E5: WORD PROBLEM APPROXIMATIONS

Adjusted Mean Scores:
CSMP Classes = 2.8
Non-CSMP Classes = 2.6
Probability Level = .03

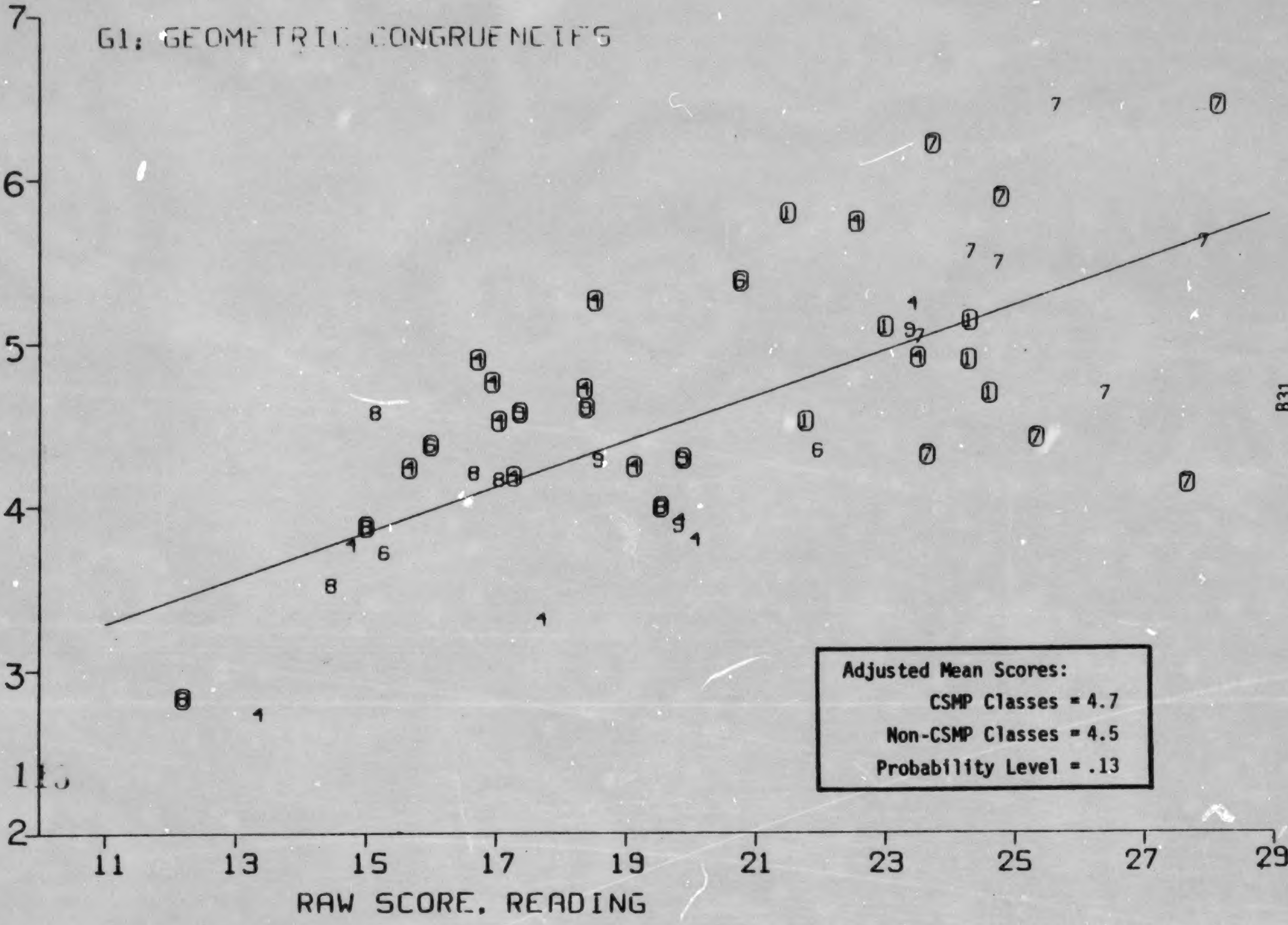
B29

G1 - Geometric Congruencies

Test Items ("Congruence" not used with students.)	Percent Correct CSMP	Percent Correct Non-CSMP
 in 2 congruent parts	90	89
 in 3 congruent parts	75	74
 in 4 congruent parts"	73	68
 in 6 congruent parts	30	25
 in 2 congruent parts	61	65
 in 3 congruent parts	24	13
 in 4 congruent parts	51	48
 in 6 congruent parts	61	55
Number of Students	627	447
KR20 Reliability/Homogeneity	.69	.69
Mean Reading Score	16.9	16.4
Correlation of Scale and Reading Scores	.37	.40

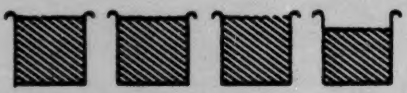
Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	3.7	4.3	4.2	4.8	5.5	4.7
Non-CSMP ($\bar{X}_2$)	3.3	3.6	3.9	4.8	5.3	4.4
($\bar{X}_1$-$\bar{X}_2$)/sd	1.0	2.3	1.1	0.3	0.6	2.1


G1: GEOMETRIC CONGRUENCIES

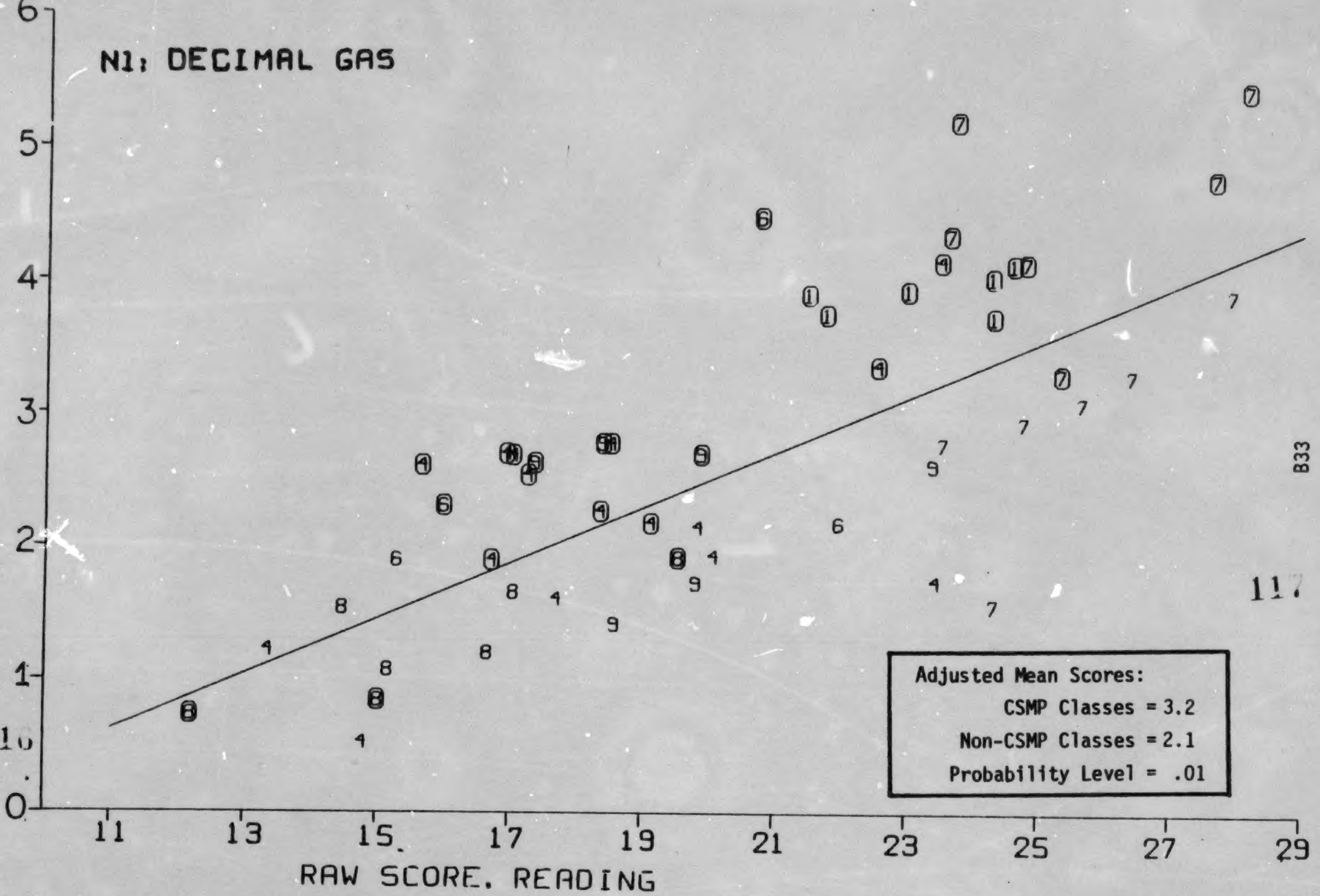
B31

N1 - Decimal Gas

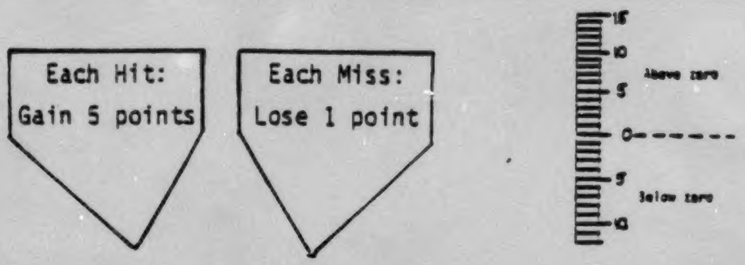
Test Items	Percent Correct CSMP	 Non-CSMP
Buying Gas Six brothers were buying gas. Each brother bought 6.5 gallons.		
1. John has 6.5 gallons. He uses up four gallons. How much gas will he have left? __________	68	53
2. Bill has 6.5 gallons. He buys another half gallon. How much gas will he have then? __________	55	32
3. Joe has 6.5 gallons. He sells each gallon for $2. How much money will he get altogether? __________	27	16
4. Tom has 6.5 gallons. He buys 3.5 more gallons. How much gas will he have then? __________	67	46
5. Ron has 6.5 gallons. Next week he will use ten times this much. How much gas will he use next week? __________	34	11
6. Ken has 6.5 gallons of gas. He gives away half of it. How much gas will he have left? __________	20	4
7. Mrs. Jones had this much gas. Each can holds 1 gallon. How many gallons did she have? Circle the best answer.  3 gallons 3.3 gallons $3\frac{1}{2}$ gallons 3.8 gallons 4 gallons	48	38
Number of Students	627	447
KR20 Reliability/Homogeneity	.76	.70
Mean Reading Score	16.9	16.4
Correlation of Scale and Reading Scores	.45	.38

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	1.5	1.8	2.3	3.4	4.6	3.1
Non-CSMP ($\overline{X}_2$)	1.1	1.0	1.5	2.1	3.1	2.0
($\overline{X}_1$-$\overline{X}_2$)/sd	1.0	3.2	3.7	5.9	7.3	9.3


N1: DECIMAL GAS
6
5
4
3
2
1
0
11
13
15
17
19
21
23
25
27
29
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 3.2
Non-CSMP Classes = 2.1
Probability Level = .01

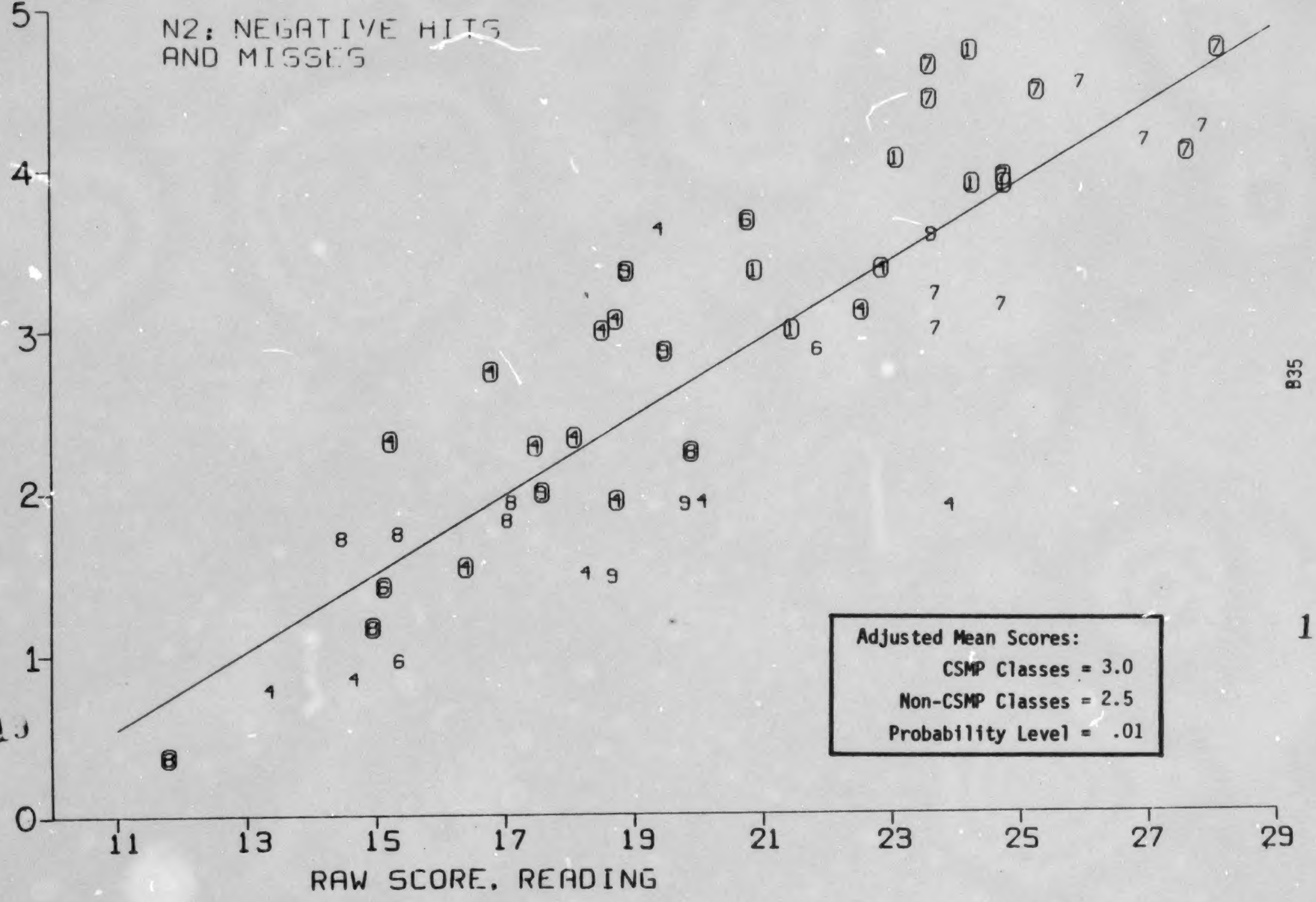
N2 - Negative Hits and Misses


Each Hit:
Gain 5 points
Each Miss:
Lose 1 point
15
10
Above zero
5
0
5
Below zero
10

Test Items	Started with a score of	Number of Hits	Number of Misses	Ended with a score of	Percent Correct CSMP	Percent Correct Non-CSMP
Bill	0	2	3		67	57
Ellen	3 below zero	2	0		52	39
May		1	6	3	46	39
Jan	3	0	7		59	46
John		2	0	15 below zero	39	27
Peter	10 below zero	1		12 below zero	41	32
Number of Students					622	455
KR20 Reliability/Homogeneity					.84	.84
Mean Reading Score					17.3	16.8
Correlation of Scale and Reading Scores					.49	.51

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	1.4	1.6	2.3	3.4	4.3	3.0
Non-CSMP ($\bar{X}_2$)	0.9	1.2	1.4	2.9	3.8	2.4
$(\bar{X}_1-\bar{X}_2)/sd$	1.4	1.4	3.5	1.8	2.5	4.7

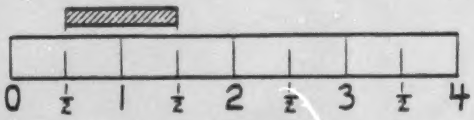
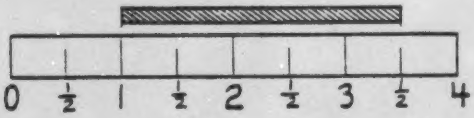
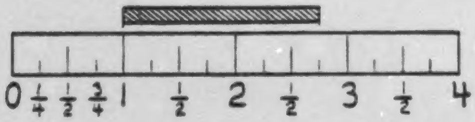
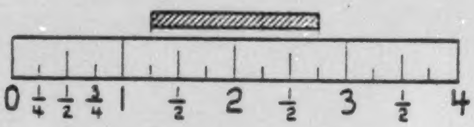
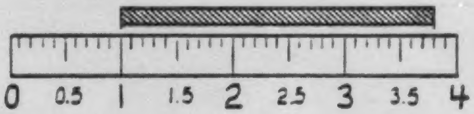
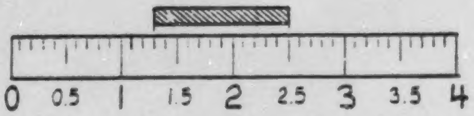


N2: NEGATIVE HITS
AND MISSES

Adjusted Mean Scores:
CSMP Classes = 3.0
Non-CSMP Classes = 2.5
Probability Level = .01

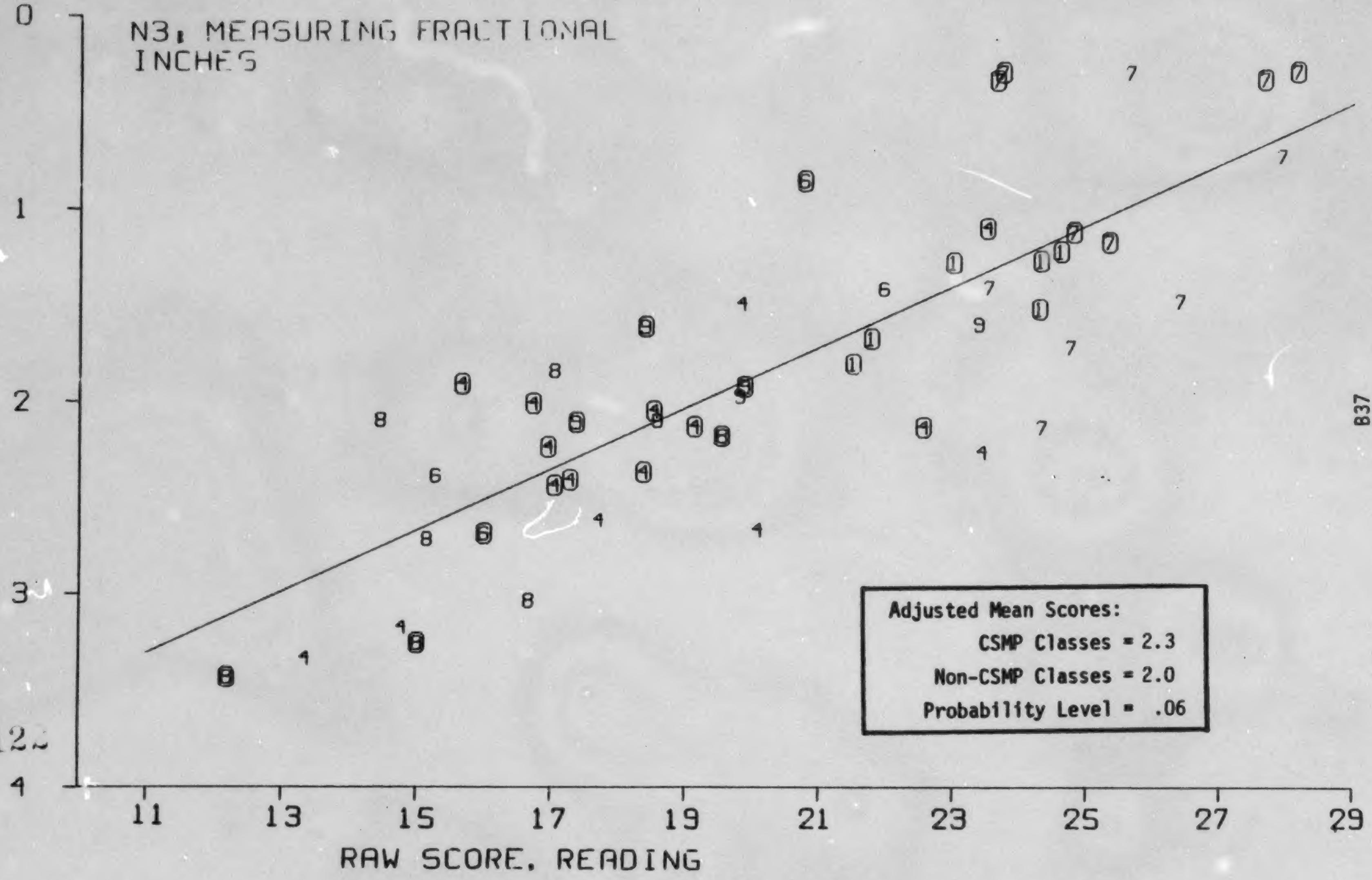
B35

N3 - Measuring Fractional Inches

Test Items	Percent Correct	
	CSMP	Non-CSMP
How Many Inches?		
 ______	73	66
 ______	56	52
 0 ¼ ½ ¾ 1 ½ 2 ½ 3 ½ 4 ______	25	25
 0 ¼ ½ ¾ 1 ½ 2 ½ 3 ½ 4 ______	38	39
 0 0.5 1 1.5 2 2.5 3 3.5 4 ______	16	10
 0 0.5 1 1.5 2 2.5 3 3.5 4 ______	18	9
Number of Students	627	447
KR20 Reliability/Homogeneity	.72	.68
Mean Reading Score	16.9	16.4
Correlation of Scale and Reading Scores	.37	.40

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	1.2	1.3	1.6	2.4	3.2	2.2
Non-CSMP ($\overline{X}_2$)	1.1	1.0	1.5	2.4	2.8	2.0
($\overline{X}_1$-$\overline{X}_2$)/sd	0.1	1.5	0.6	0.2	1.8	1.9



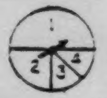
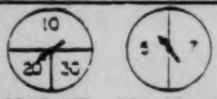
Adjusted Mean Scores:

CSMP Classes = 2.3

Non-CSMP Classes = 2.0

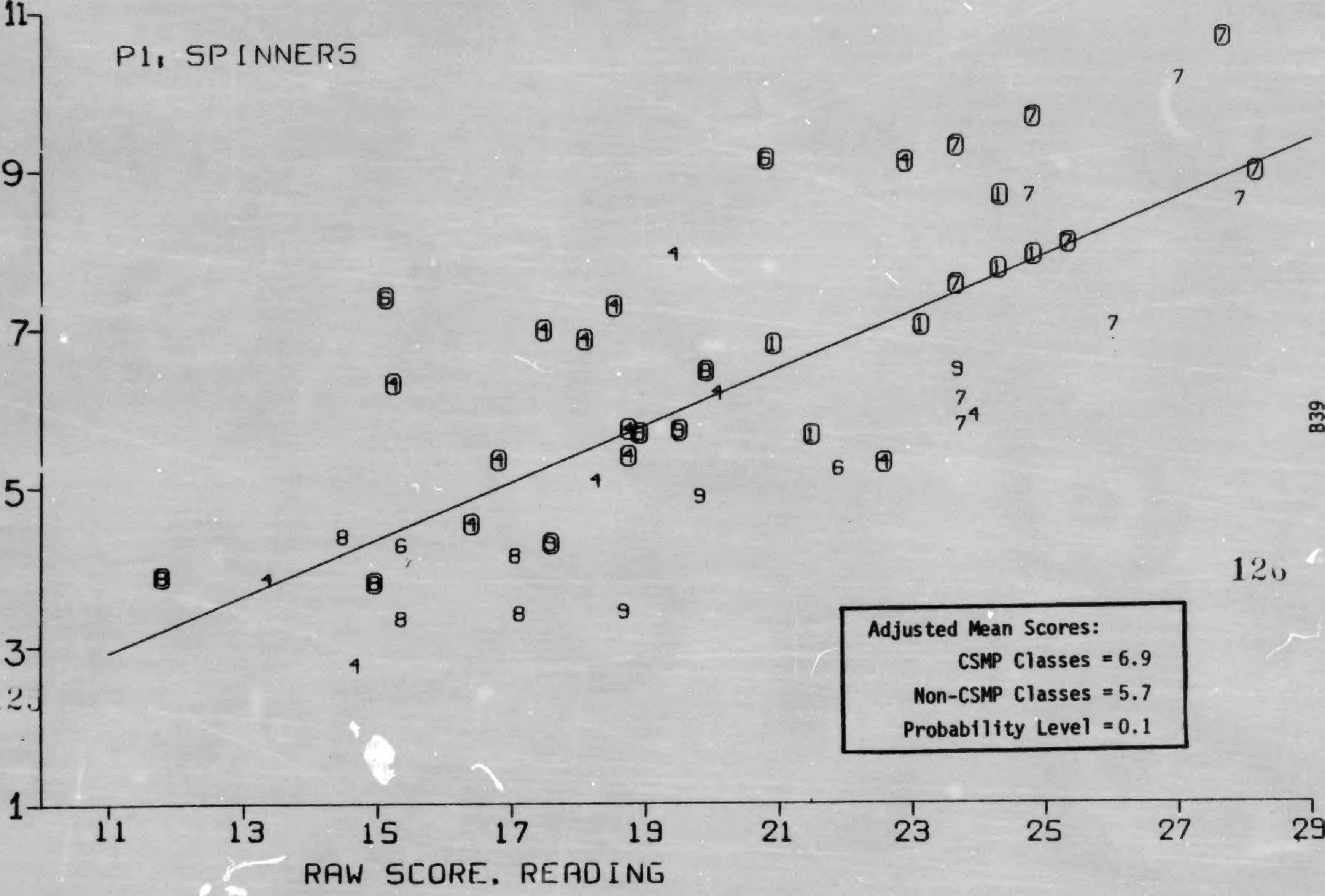
Probability Level = .06

P1 - Spinners

Test Items	Allowable Range	Percent Correct CSMP	Percent Correct Non-CSMP
			
SUPPOSE WE PLAY THE GAME 100 TIMES	Allowable Range		
About how many times would we get a score of 1?____	(40-60)	51	26
About how many times would we get a score of 2?____	(20-30)	60	41
About how many times would we get a score of 3?____	(10-20)	52	52
About how many times would we get a score of 4?____	(10-20)	49	36
About how many times would we get a score of less than 4? ____	(80-90)	19	26
First 4 responses add to 100		31	23
Third response = Fourth response		44	25
First 3 responses = Fifth response		19	18
First response > second > third & fourth		38	30
Last 2 responses add to 100		18	17
 SCORES YOU COULD GET 25, 17, 35, 15, 27, 37			
SUPPOSE WE PLAY THE GAME 100 TIMES	Allowable Range		
About how many times would we get a score of 15? ______	(20-30)	30	29
About how many times would we get a score of 17? ____	(20-30)	33	31
About how many times would we get a score of [illegible]5? ____	(10-25)	44	40
About how many times would we get a score of less than 20?____	(40-60)	14	08
About how many times would we get a score of less than 30? ____	(60-90)	15	08
First response = Second response		43	28
First & second responses > third response		62	65
First + second response = fourth response		13	10
Fifth response > fourth response		52	51
Number of Students		622	455
Mean Reading Score		17.3	16.8
Correlation of Scale and Reading Scores		.36	.36

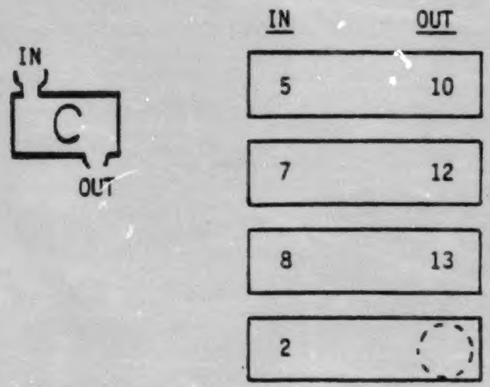
Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	4.0	5.6	5.7	7.0	8.9	6.9
Non-CSMP ($\bar{X}_2$)	3.5	4.2	4.0	6.0	7.2	5.4.
$(\bar{X}_1-\bar{X}_2)/sd$	0.5	2.9	3.7	2.0	3.3	5.7



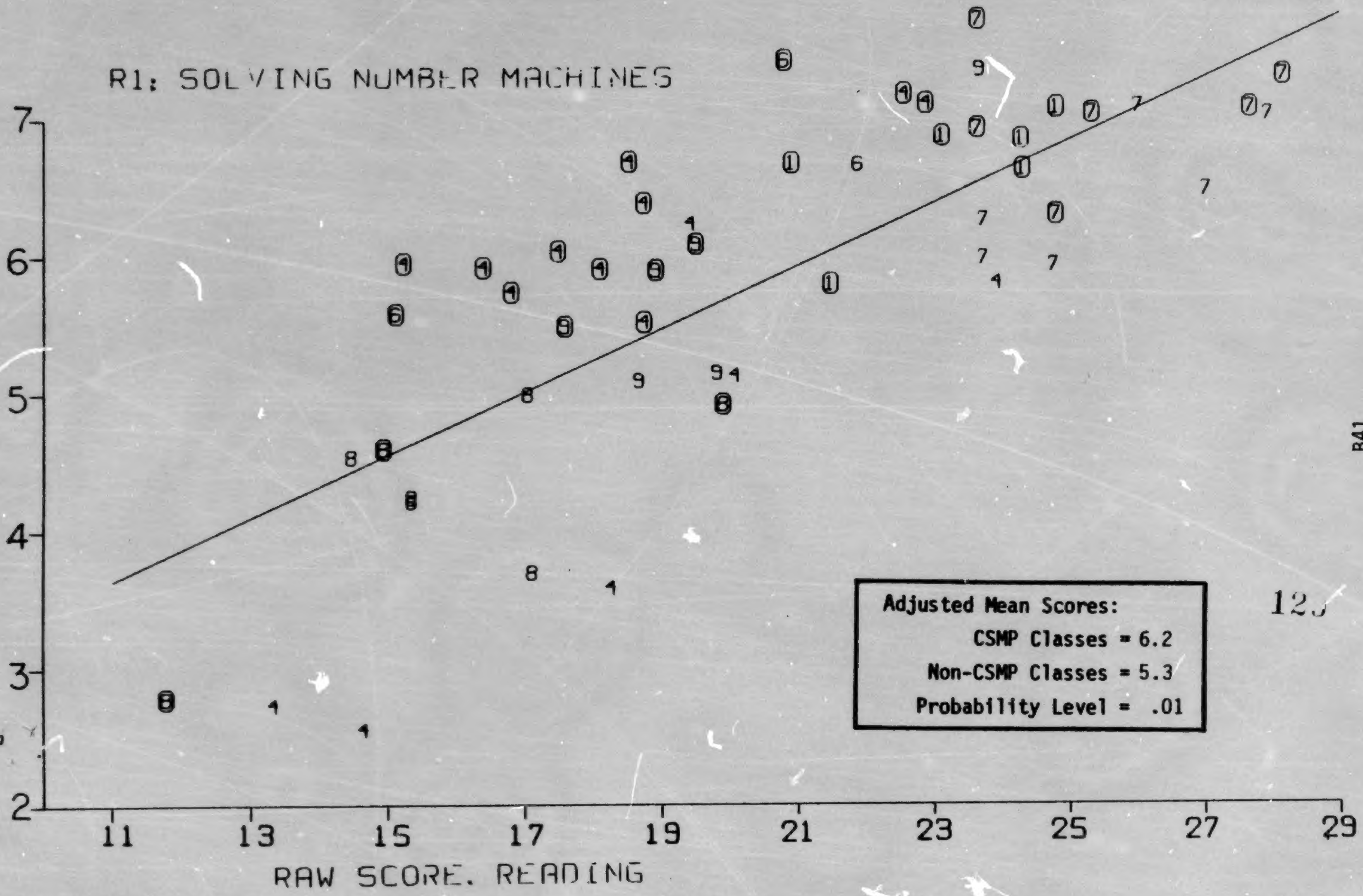
Adjusted Mean Scores:
CSMP Classes = 6.9
Non-CSMP Classes = 5.7
Probability Level = 0.1

R1 - Solving Number Machines

Test Items		Percent Correct	
		CSMP	Non-CSMP
WHAT CAME OUT? General format:			
Abbreviated format for page B40 only:	(5,10) (7,12) (8,13) (2,)	79	69
	(6,12) (2,4) (7,14) (,8)	86	71
	(10,5) (4,2) (8,4) (6,)	87	75
	(3,1) (11,9) (10,8) (15,)	86	79
	(3,12) (5,20) (10,40) (4,)	69	59
	(2,6) (5,9) (10,14) (,12)	81	67
	(6,3) (16,13) (8,5) (,9)	72	59
	(,2) (30,10) (15,5) (9,3)	62	47
	Number of Students	622	455
	KR20 Reliability/Homogeneity	.81	.82
	Mean Reading Score	17.3	16.8
	Correlation of Scale and Reading Scores	.50	.52

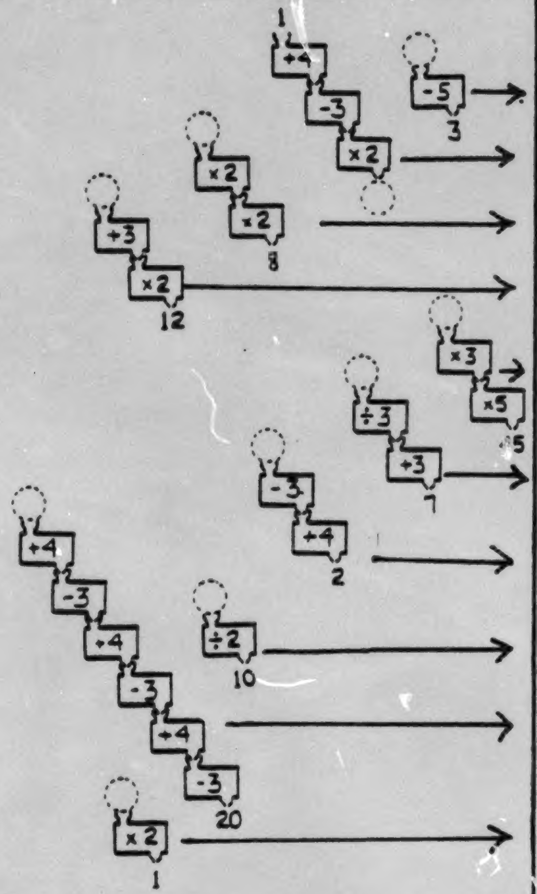
Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	4.1	4.9	5.9	6.4	7.4	6.2
Non-CSMP ($\bar{X}_2$)	3.2	3.8	4.4	6.1	6.7	5.3
($\bar{X}_1$-$\bar{X}_2$)/sd	1.8	2.7	4.9	1.5	5.0	6.8


R1: SOLVING NUMBER MACHINES
7
6
5
4
3
2
11
13
15
17
19
21
23
25
27
29
RAW SCORE. READING
Adjusted Mean Scores:
CSMP Classes = 6.2
Non-CSMP Classes = 5.3
Probability Level = .01

B41

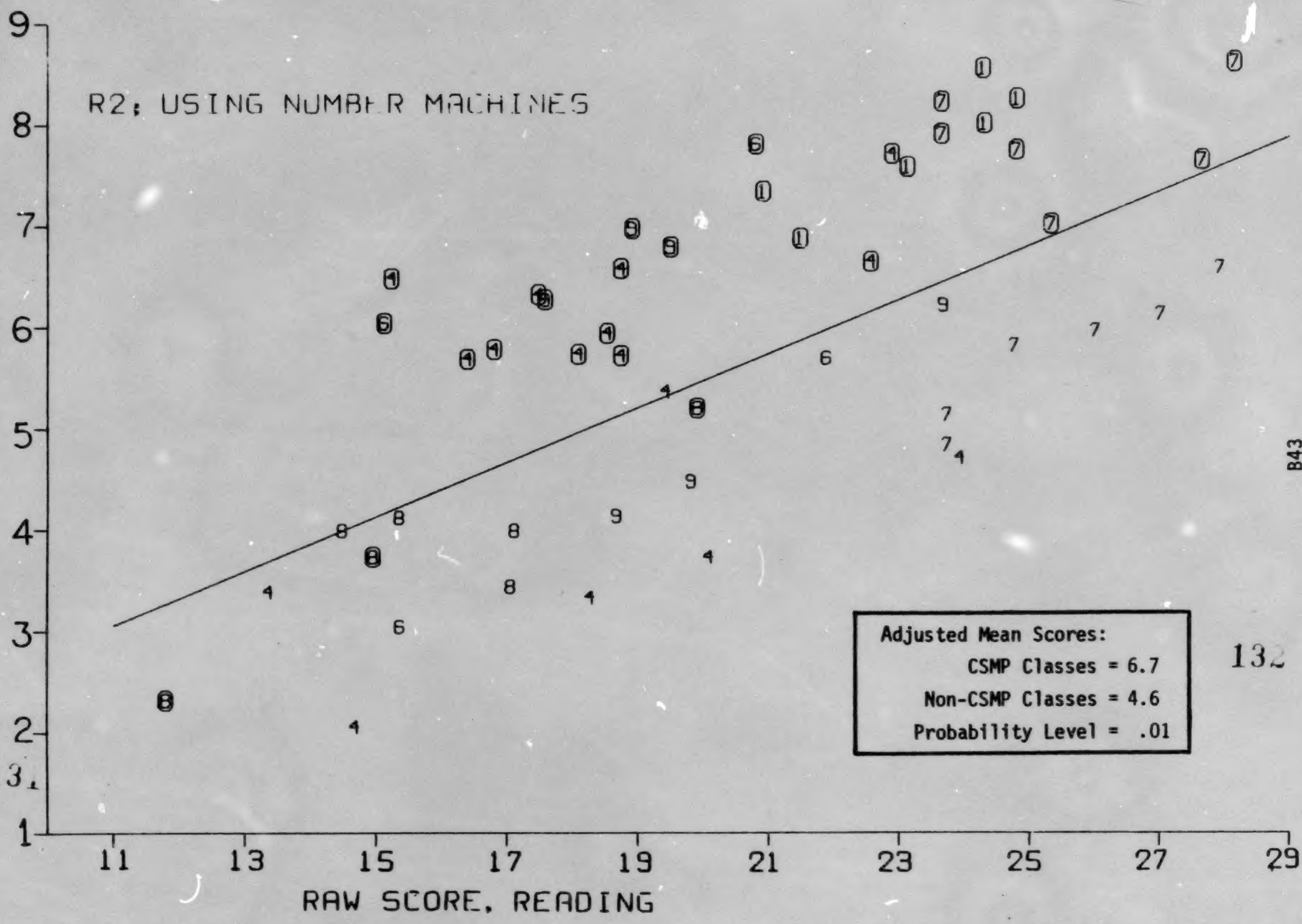
R2 - Using Number Machines


1
+4
-3
×2
-5
3
×2
×2
8
+3
×2
12
×3
×5
45
÷3
+3
7
-3
+4
2
+4
-3
+4
-3
+4
-3
20
÷2
10
×2
1

Test Items	Percent Correct	
	CSMP	Non-CSMP
	85	68
	91	85
	85	73
	86	71
	64	61
	57	30
	52	22
	56	29
	48	21
	42	7
Number of Students	622	455
KR20 Reliability/Homogeneity	.80	.73
Mean Reading Score	17.3	16.8
Correlation of Scale and Reading Scores	.55	.52

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	4.1	4.8	6.1	7.0	8.3	6.7
Non-CSMP ($\bar{X}_2$)	2.7	3.3	3.6	5.3	5.9	4.6
$(\bar{X}_1-\bar{X}_2)/sd$	2.9	3.8	8.2	6.5	11.6	13.4


R2: USING NUMBER MACHINES
9
8
7
6
5
4
3
2
1
11
13
15
17
19
21
23
25
27
29
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 6.7
Non-CSMP Classes = 4.6
Probability Level = .01

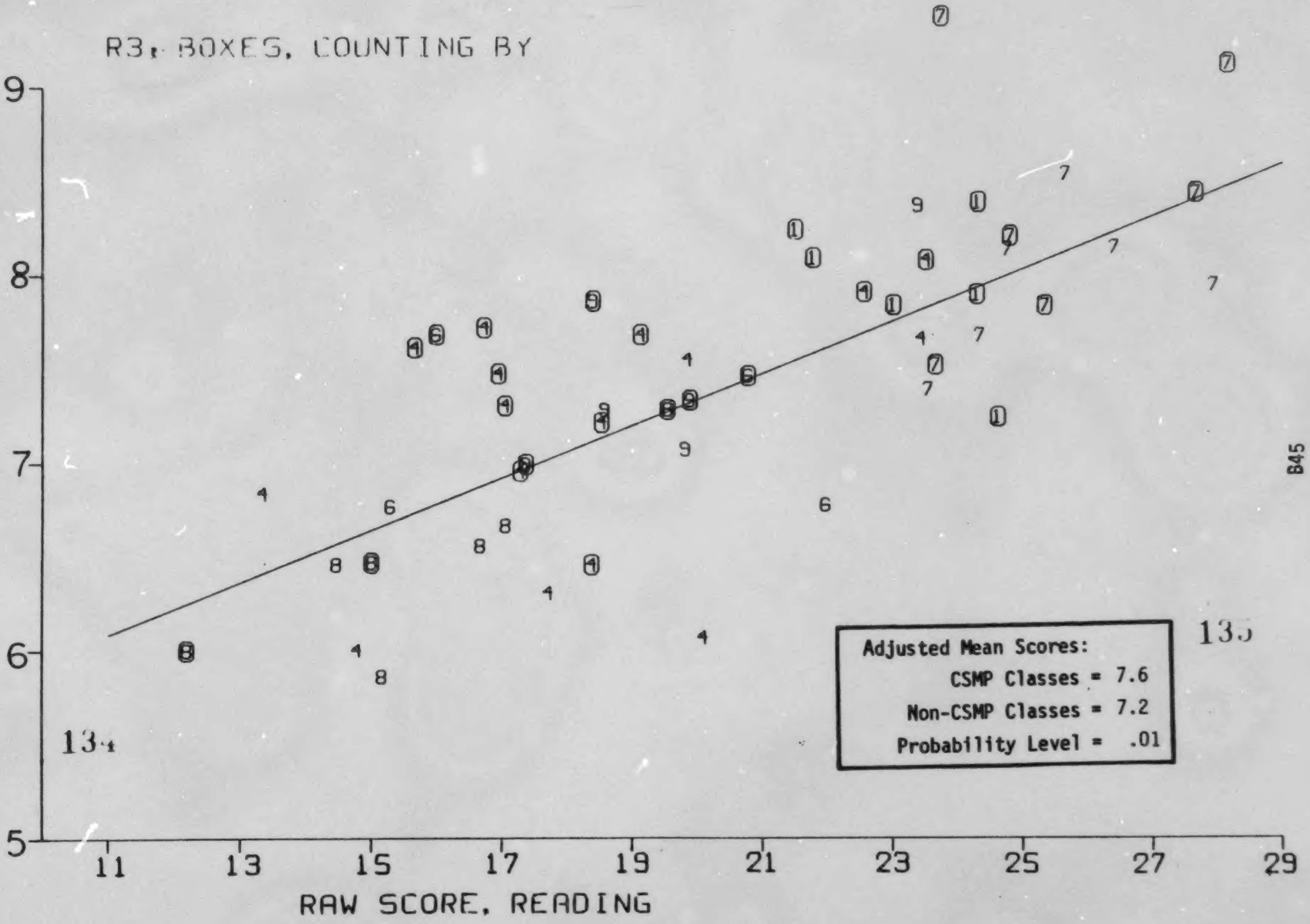
B43

R3 - Boxes, Counting By

Test Items		Percent Correct	
		CSMP	Non-CSMP
Counting by 5's . . . 41 46 51 56 61 . . .	Will 26 be in any of the boxes? ______	74	72
	Will 156 be in any of the boxes? ______	76	68
	Will 500 be in any of the boxes? ______	79	76
Counting by 7's . . . 60 67 74 81 88 . . .	Will 46 be in any of the boxes? ______	38	33
	Will 70 be in any of the boxes? ______	77	74
	Will 700 be in any of the boxes? ______	59	58
Counting by 98's . . . 0 98 196 294 392 . . .	Will 492 be in any of the boxes? ______	52	43
	Will 980 be in any of the boxes? ______	49	41
	Will 690 be in any of the boxes? ______	67	67
Counting by 3's . . . 298 301 304 307 310 . . .	Will 340 be in any of the boxes? ______	54	51
	Will 341 be in any of the boxes? ______	55	51
	Will 610 be in any of the boxes? ______	62	63
	Number of Students	627	447
	KR20 Reliability/Homogeneity	.63	.56
	Mean Reading Score	16.9	16.4
	Correlation of Scale and Reading Scores	.43	.42

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	6.8	6.7	7.1	7.8	8.4	7.6
Non-CSMP ($\bar{X}_2$)	6.1	6.5	6.9	7.2	7.9	7.1
($\bar{X}_1$-$\bar{X}_2$)/sd	1.2	0.6	0.9	2.5	1.8	3.3



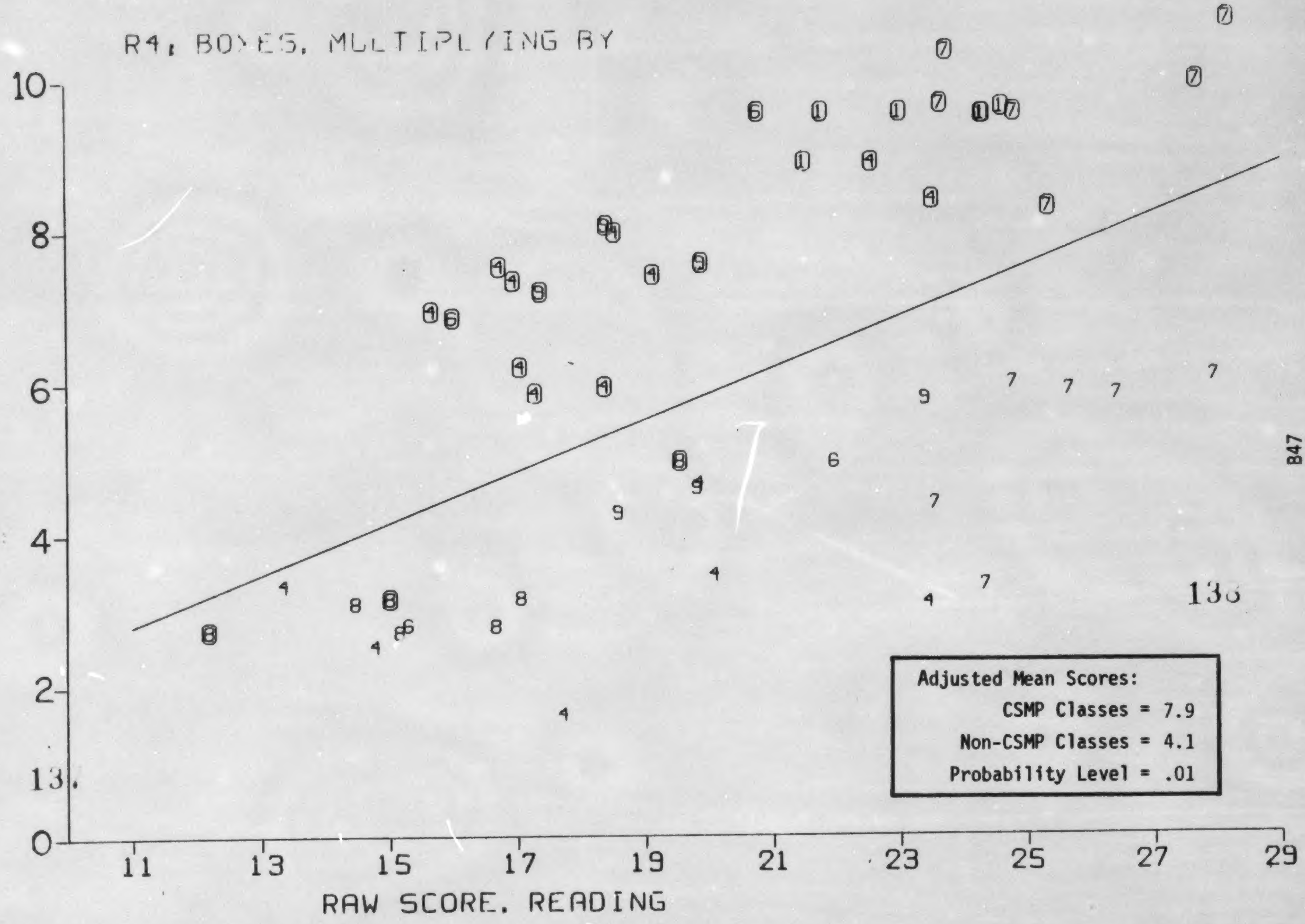
Adjusted Mean Scores:
CSMP Classes = 7.6
Non-CSMP Classes = 7.2
Probability Level = .01

R4 - Boxes, Multiplying By

Test Items ("A" and "B" etc. used only to guide the reader)		Percent Correct	
		CSMP	Non-CSMP
Multiplying by			
• • • 3 6 12 A 48 • • •	Box A	82	61
• • • C 1 B A 1,000 10,000 100,000 • • •	Box A	75	50
	Box B	68	44
	Box C	24	4
• • • D C 50 B 200 400 800 A • • •	Box A	65	30
	Box B	80	54
	Box C	75	33
	Box D	38	10
• • • D C B 2 4 8 A 32 • • •	Box A	76	48
	Box B	76	39
	Box C	41	7
	Box D	25	5
• • • 2 A 18 • • •	Box A	40	19
Number of Students		627	447
KR20 Reliability/Homogeneity		.88	.79
Mean Reading Score		16.9	16.4
Correlation of Scale and Reading Scores		.55	.39

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	4.5	5.4	6.7	8.3	10.1	7.8
Non-CSMP ($\overline{X}_2$)	2.6	2.6	2.9	4.7	5.5	4.1
($\overline{X}_1$-$\overline{X}_2$)/sd	3.1	5.8	9.8	9.5	14.0	17.9



R4, BOXES, MULTIPLYING BY

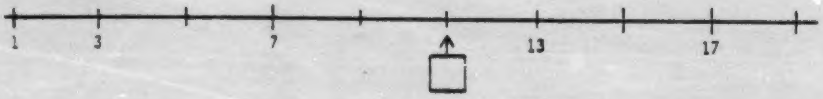
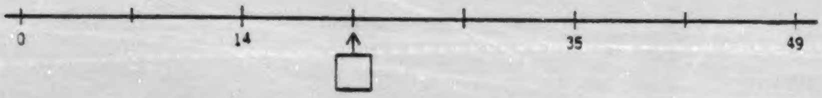
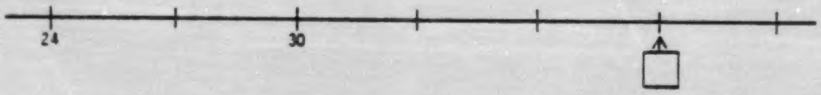
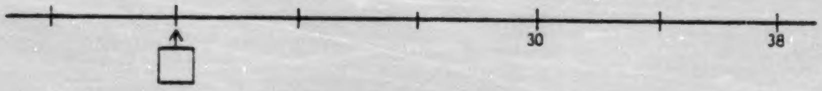
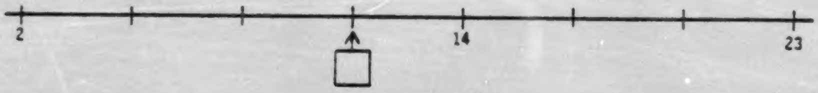
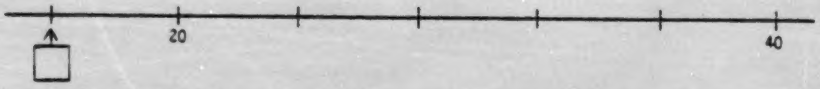
Adjusted Mean Scores:

CSMP Classes = 7.9

Non-CSMP Classes = 4.1

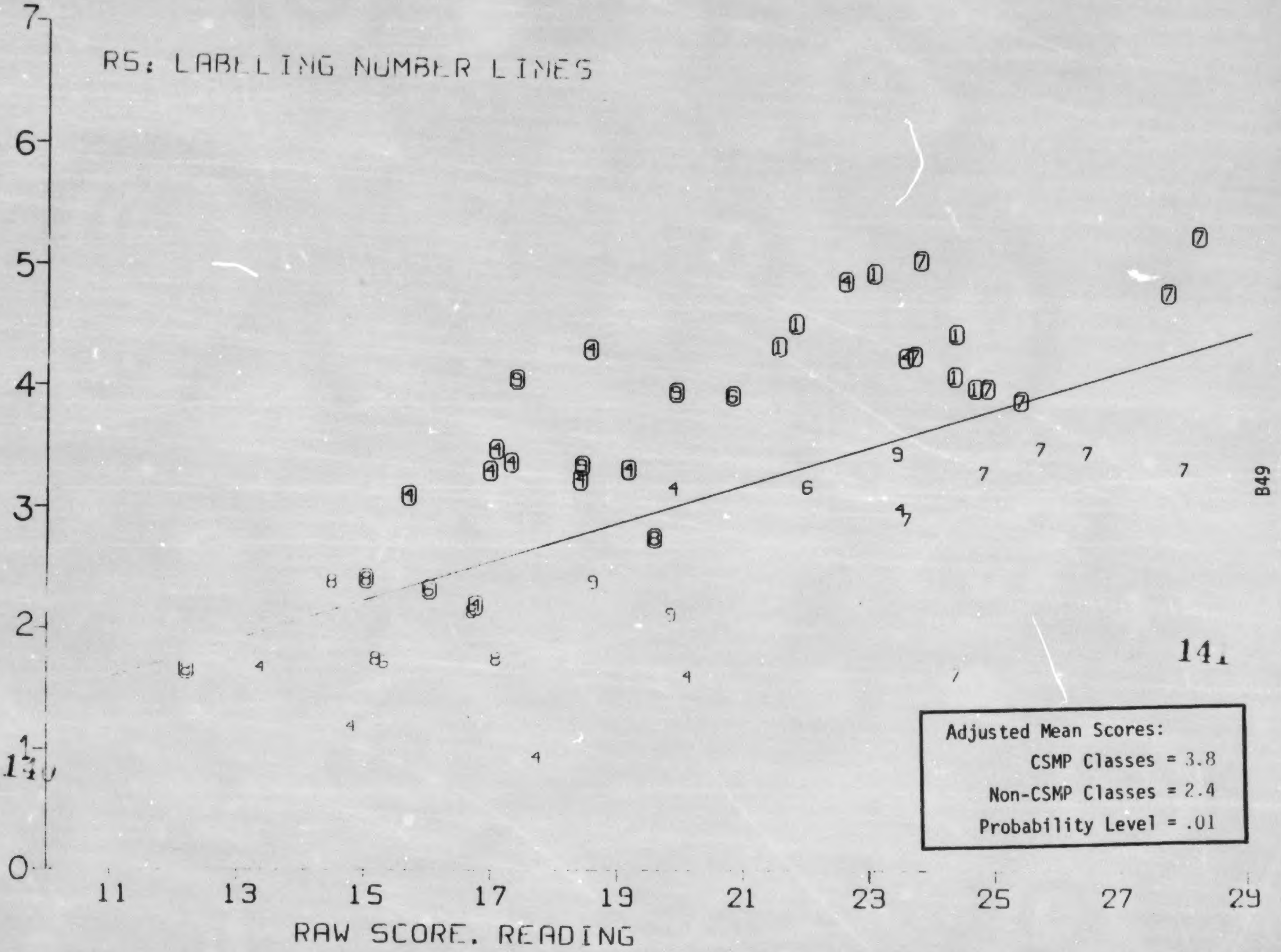
Probability Level = .01

R5 - Labelling Number Lines

Test Items	Percent Correct CSMP	Percent Correct Non-CSMP
	82	69
	74	62
	56	35
	51	22
	58	32
	44	18
Number of Students	627	447
KR20 Reliability/Homogeneity	.82	.75
Mean Reading Score	16.9	16.4
Correlation of Scale and Reading Scores	.50	.46

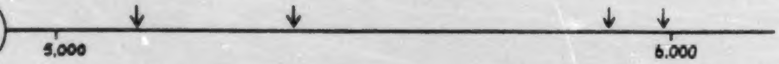
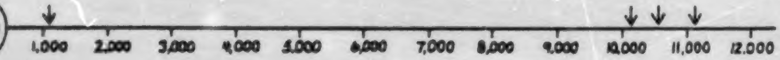
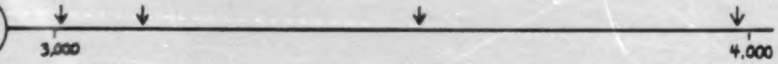
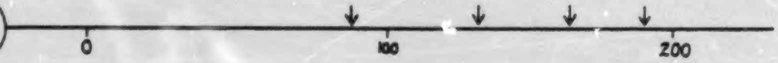
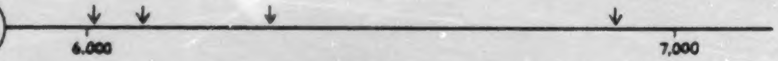
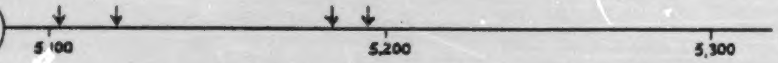
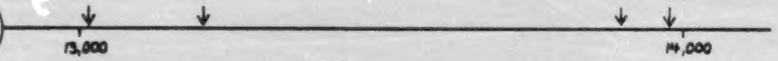
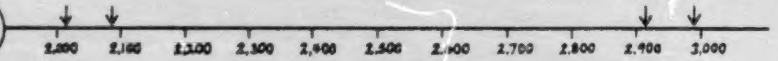
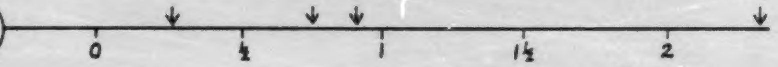
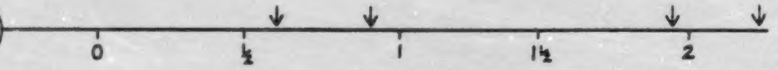
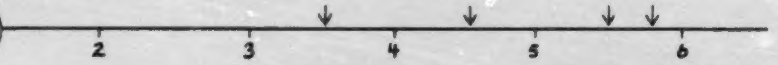
Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	2.3	2.4	3.4	4.0	4.8	3.8
Non-CSMP ($\overline{X}_2$)	1.4	1.8	1.7	2.7	3.4	2.4
($\overline{X}_1$-$\overline{X}_2$)/sd	2.6	2.2	7.1	5.9	7.2	11.0



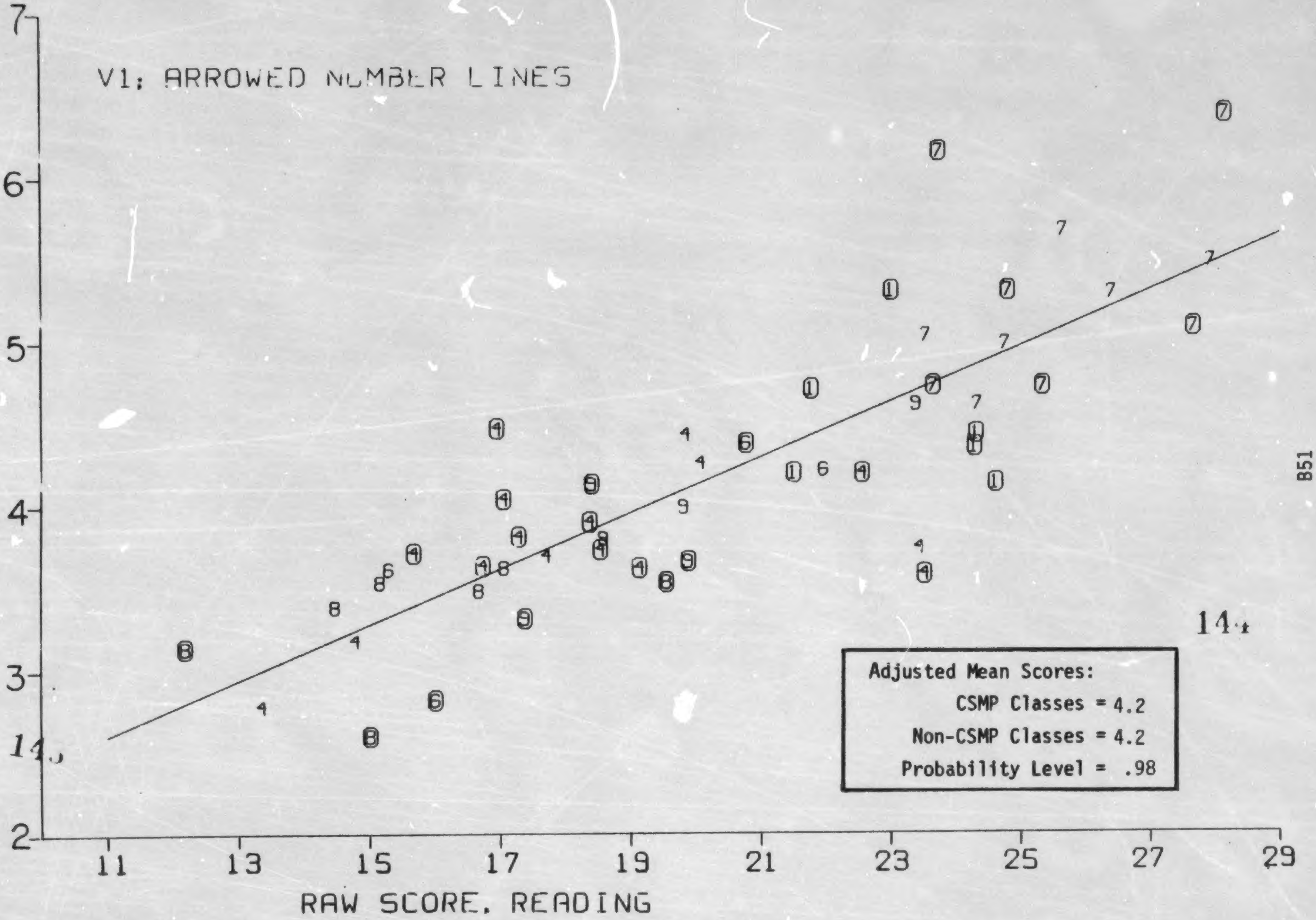
Adjusted Mean Scores:
CSMP Classes = 3.8
Non-CSMP Classes = 2.4
Probability Level = .01

V1 - Arrowed Number Lines: intergers

Test Items (Choose arrow to match number)		Percent Correct	
		CSMP	Non-CSMP
5,399		64	57
10,100	 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000 11,000 12,000	49	55
3,005		49	56
192		48	55
6,109		37	33
5,195	 5,100 5,200 5,300	21	22
13,902	 13,000 14,000	67	62
2,090	 2,000 2,100 2,200 2,300 2,400 2,500 2,600 2,700 2,800 2,900 3,000	70	64
$\frac{1}{4}$		36	33
$\frac{9}{10}$		46	45
$5\frac{3}{4}$		24	32
	Number of Students	627	447
	KR20 Reliability/Homogeneity	.70	.65
	Mean Reading Score	16.9	16.4
	Correlation of Scale and Reading Scores	.53	.52

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	3.4	3.0	3.7	4.2	5.2	4.1
Non-CSMP ($\overline{X}_2$)	3.2	3.1	3.8	4.3	5.2	4.2
($\overline{X}_1$-$\overline{X}_2$)/sd	0.2	-0.5	-0.2	-0.4	-0.3	0.6


V1: ARROWED NUMBER LINES
7
6
5
4
3
2
11
13
15
17
19
21
23
25
27
29
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 4.2
Non-CSMP Classes = 4.2
Probability Level = .98

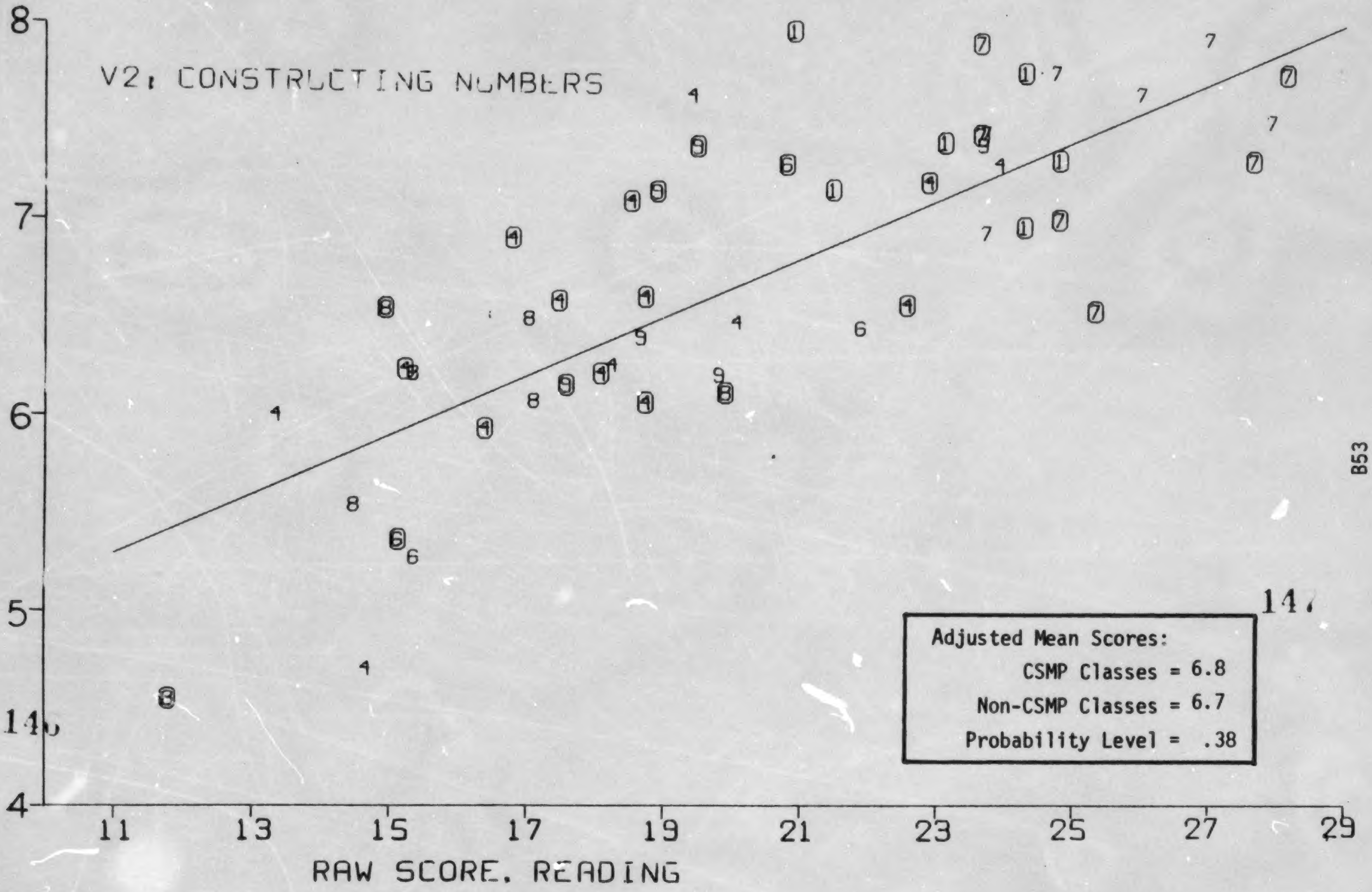
B51

V2 - Constructing Numbers

Test Items	Percent Correct	
	CSMP	Non-CSMP
USE ONLY THESE DIGITS		
5 7 2 8		
Which is the smallest two-digit number we can make? — —	85	83
Which is the largest two-digit number we can make? — —	83	81
Which is the smallest three-digit number we can make? — — —	85	85
Which is the largest three-digit number we can make? — — —	86	85
Which three-digit number is closest to 600? — — —	65	57
Which is the smallest four-digit number we can make? —,— — —	86	86
Which is the largest four-digit number we can make? —,— — —	86	86
Which four-digit number is closest to 5,000? —,— — —	44	39
Which four-digit number is closest to 8,000? —,— — —	44	37
Which four-digit number is closest to 7,400? —,— — —	17	18
Number of Students	622	455
KR20 Reliability/Homogeneity	.76	.74
Mean Reading Score	17.3	16.8
Correlation of Scale and Reading Scores	.37	.38

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	5.3	5.4	6.4	7.3	7.7	6.8
Non-CSMP ($\bar{X}_2$)	5.0	5.6	6.0	7.0	7.6	6.6
$(\bar{X}_1-\bar{X}_2)/sd$	0.4	-0.4	1.0	1.4	0.4	1.3



Adjusted Mean Scores:
CSMP Classes = 6.8
Non-CSMP Classes = 6.7
Probability Level = .38

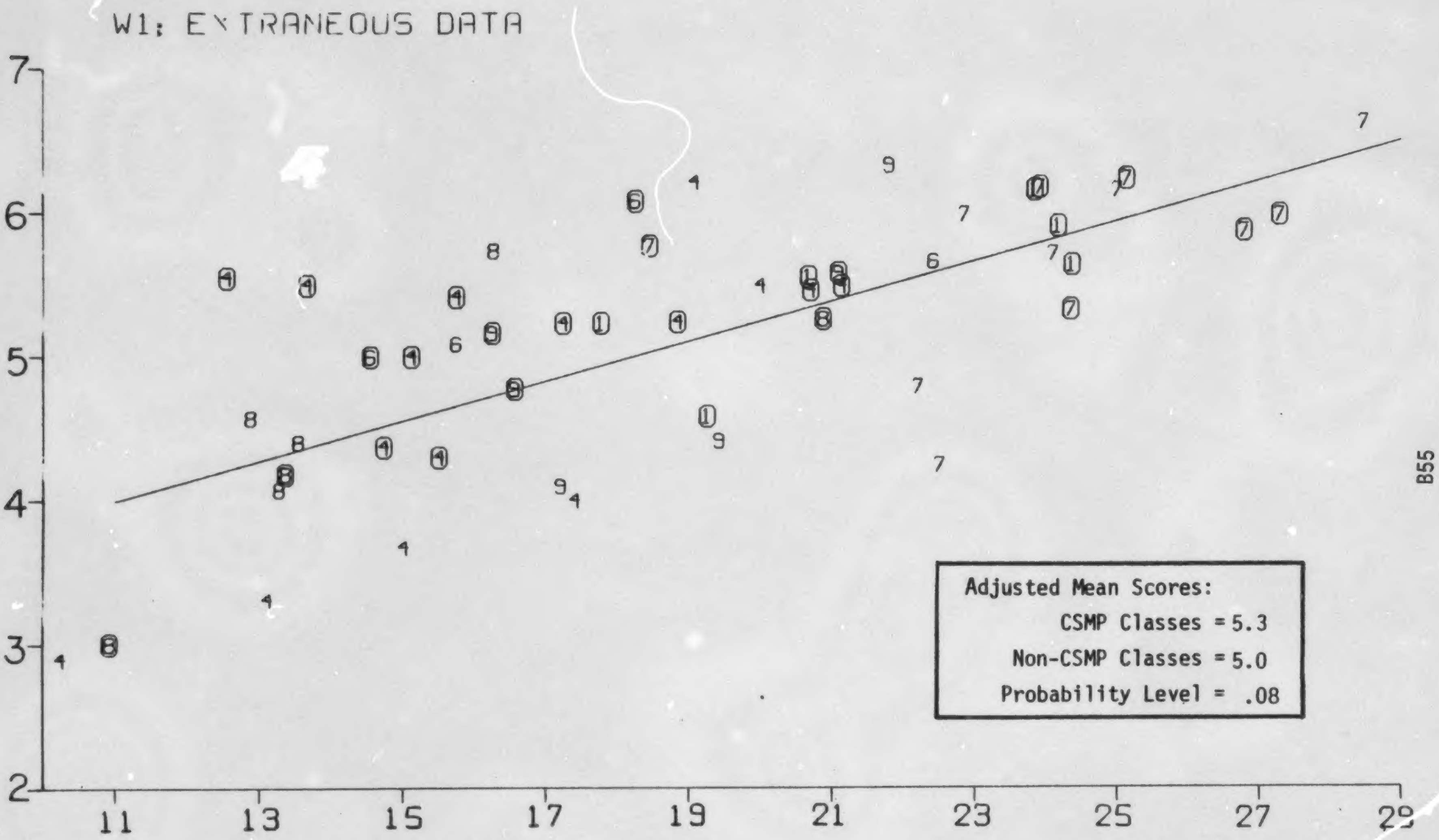
B53

W1 - Extraneous Data

Test Items	Percent Correct	
	CSMP	Non-CSMP
1. A belt costs $4. A shirt costs $5. A hat costs $10. How much more does a hat cost than a belt? ________	83	78
2. Bill gave 80¢ to his sister. He now has 60¢. Pencils cost 10¢ each. How many pencils can he buy? ________	89	82
3. Joe started with 40 marbles. Marbles cost 3¢ each. His father gave him 4 more. Then his mother gave him 5 more. How many marbles did he have then? ________	87	82
4. Yesterday Ann bought 3 books. Books cost 20¢ each. Ann has 30¢ left. She wants to buy a game that costs 45¢. How much more money does she need to buy the game? ________	85	81
5. There are 32 tablespoons in a pint. There are 2 pints in a quart. There are 4 quarts in a gallon. How many pints are in 5 quarts? ________	60	62
6. Sue has 12 bottles. It takes 36 bottles to fill a case. It takes 6 bottles to fill a carton. How many cartons can Sue fill? ________	74	67
7. Peter has $10. He needs 4 pounds of candy. Candy is $2 per pound. He is buying candy for 6 people. How much will the candy cost altogether? ________	49	47
Number of Students	337	236
KR20 Reliability/Homogeneity	.67	.77
Mean Reading Score	16.8	16.0
Correlation of Scale and Reading Scores	.44	.55

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\bar{X}_1$)	4.2	4.4	4.8	5.5	6.1	5.3
Non-CSMP ($\bar{X}_2$)	3.0	4.0	4.7	5.5	6.0	5.0
$(\bar{X}_1-\bar{X}_2)/sd$	1.9	0.8	0.5	0.2	0.5	1.6

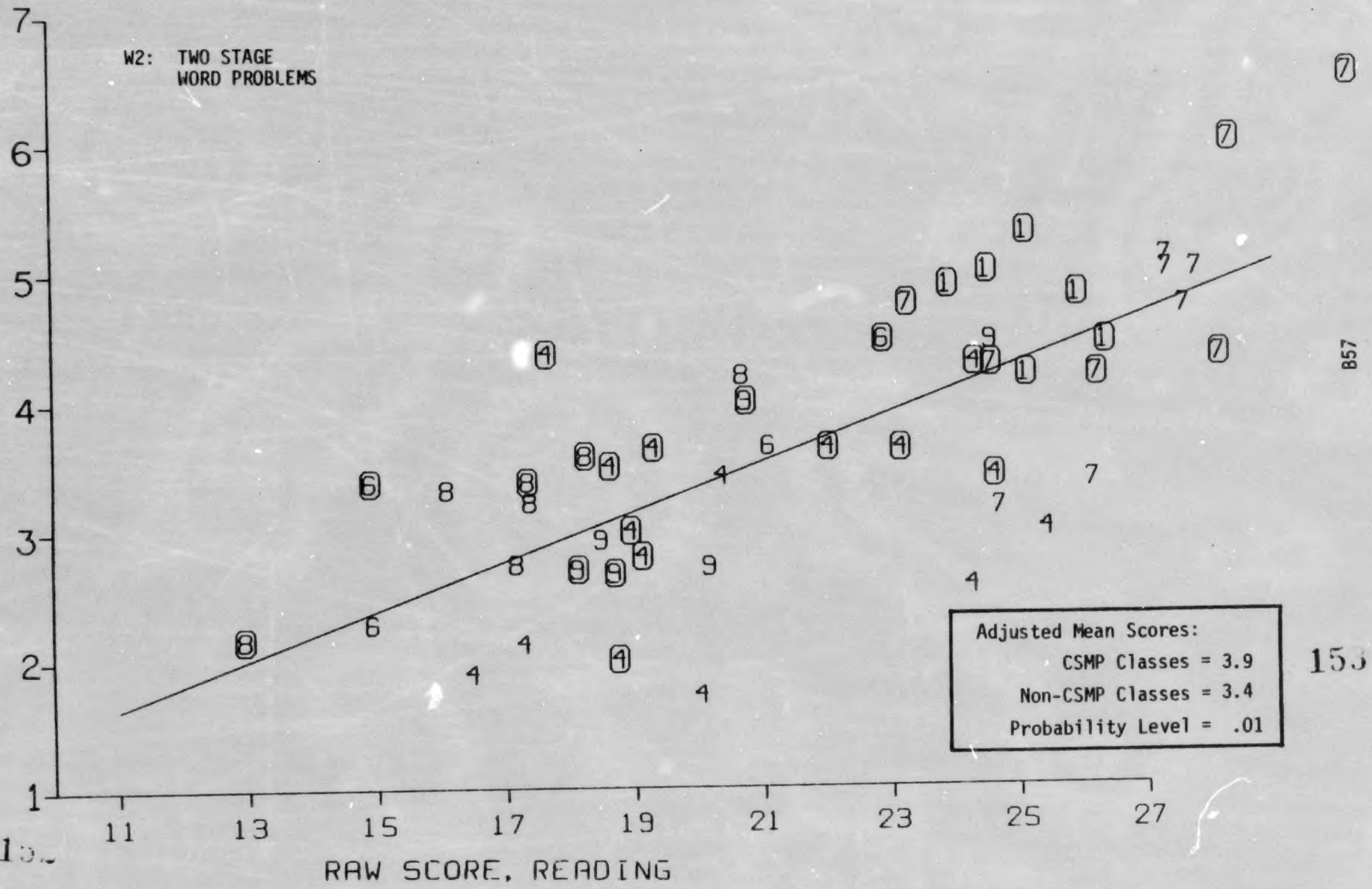

W1: EXTRANEOUS DATA
7
6
5
4
3
2
11
13
15
17
19
21
23
25
27
29
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 5.3
Non-CSMP Classes = 5.0
Probability Level = .08

W2 - Two Stage Word Problems

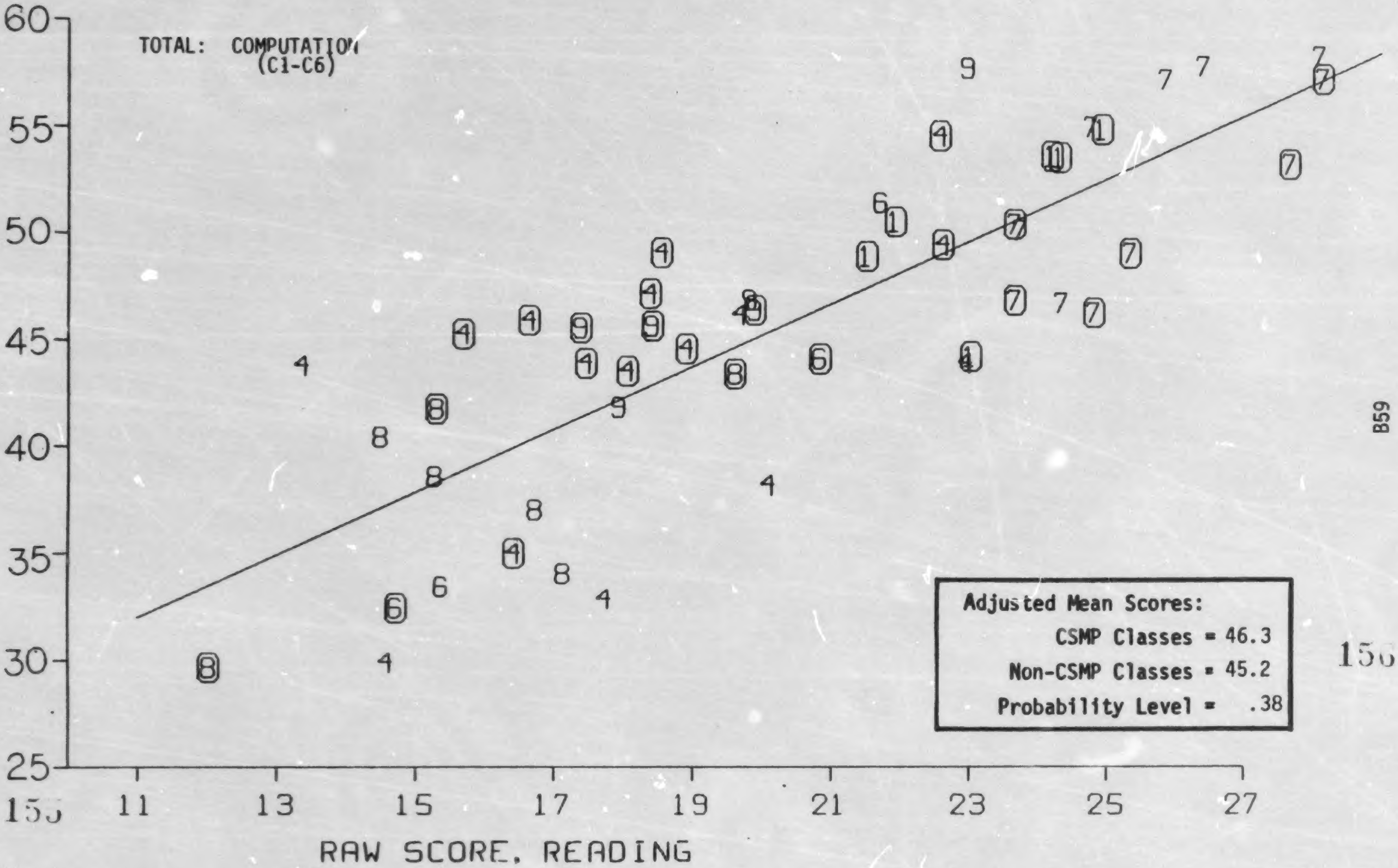
Test Items	Percent Correct	
	CSMP	Non-CSMP
1. Shirts cost $10 each and ties cost $5 each. Peter bought 2 shirts and 3 ties. What was his total cost? ______	77	69
2. Joan starts with $40. Each week she spends $2. How much will she have left after 5 weeks? ______	49	40
3. The cost of gum is 3 pieces for 10¢. How many pieces can we buy for 40¢? ______	64	59
4. Pam gets 50¢ each week. She always spends 30¢ and saves the rest. How much will she save in 4 weeks? ______	56	52
5. On Saturday Amy and Susan made $13 selling lemonade. On Sunday they made $5. They put their money together and divided it evenly. How much did each girl get? ______	66	56
6. Jim has $10 in his bank now. Each week he will add $5 to his bank. In how many weeks will he have $30 in his bank? ______	50	41
7. John has 5¢ more than Tom. Ann has 3¢ less than Tom. If John has 20¢, how much does Ahn have? ______	27	24
Number of Students	315	237
KR20 Reliability/Homogeneity	.69	.75
Mean Reading Score	17.8	17.5
Correlation of Scale and Reading Scores	.52	.47

Means by Ability Level

	1	2	3	4	5	Combined
CSMP ($\overline{X}_1$)	2.5	2.6	3.5	4.1	5.1	3.9
Non-CSMP ($\overline{X}_2$)	2.3	2.6	2.6	3.6	4.6	3.4
($\overline{X}_1-\overline{X}_2$)/sd	0.1	0.0	2.5	1.4	1.8	2.8


W2: TWO STAGE WORD PROBLEMS
7
6
5
4
3
2
1
11
13
15
17
19
21
23
25
27
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 3.9
Non-CSMP Classes = 3.4
Probability Level = .01

The graphs which follow are graphs of class means for total scores according to various scale categories (Computation, Estimation, etc.)



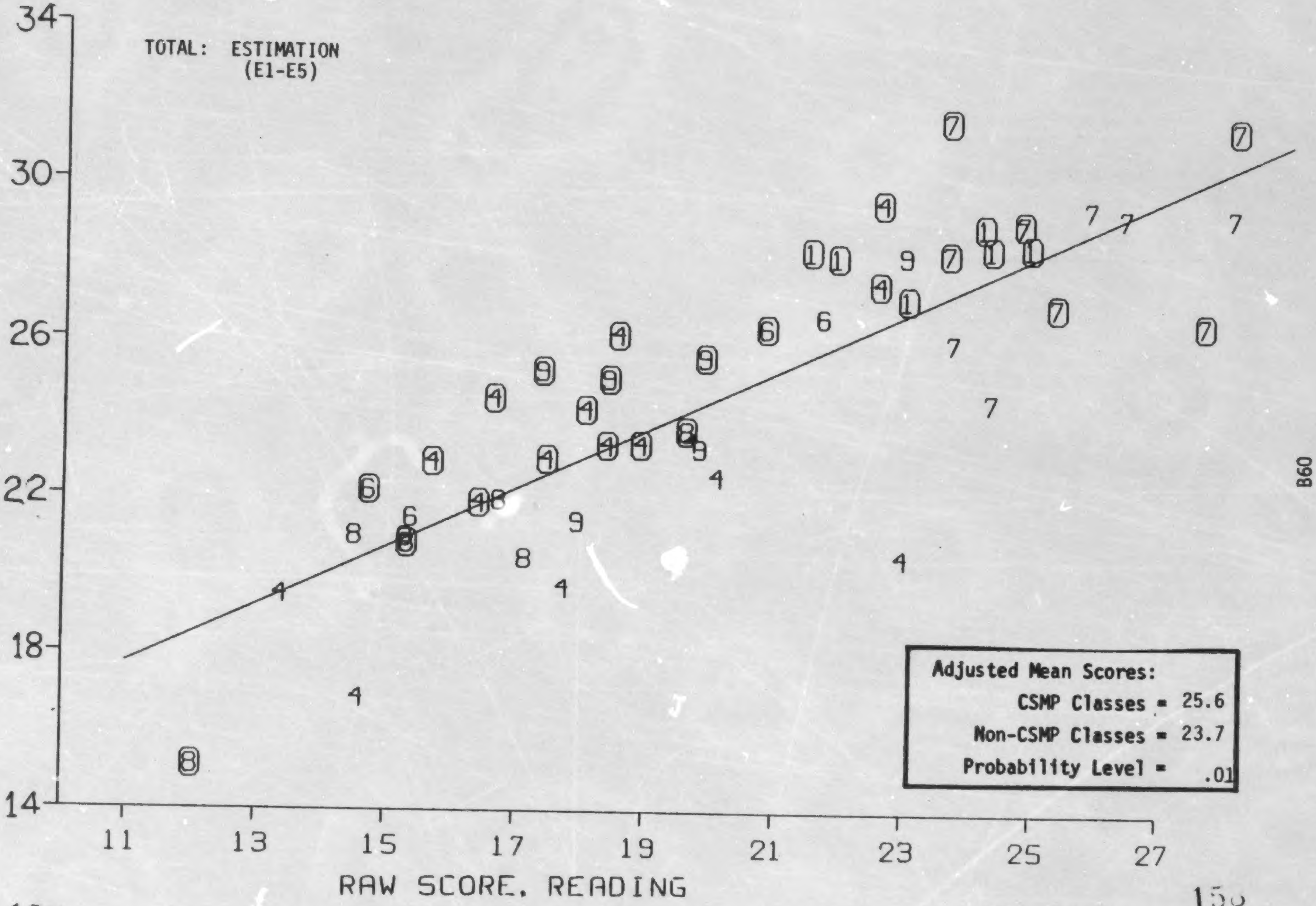
Adjusted Mean Scores:

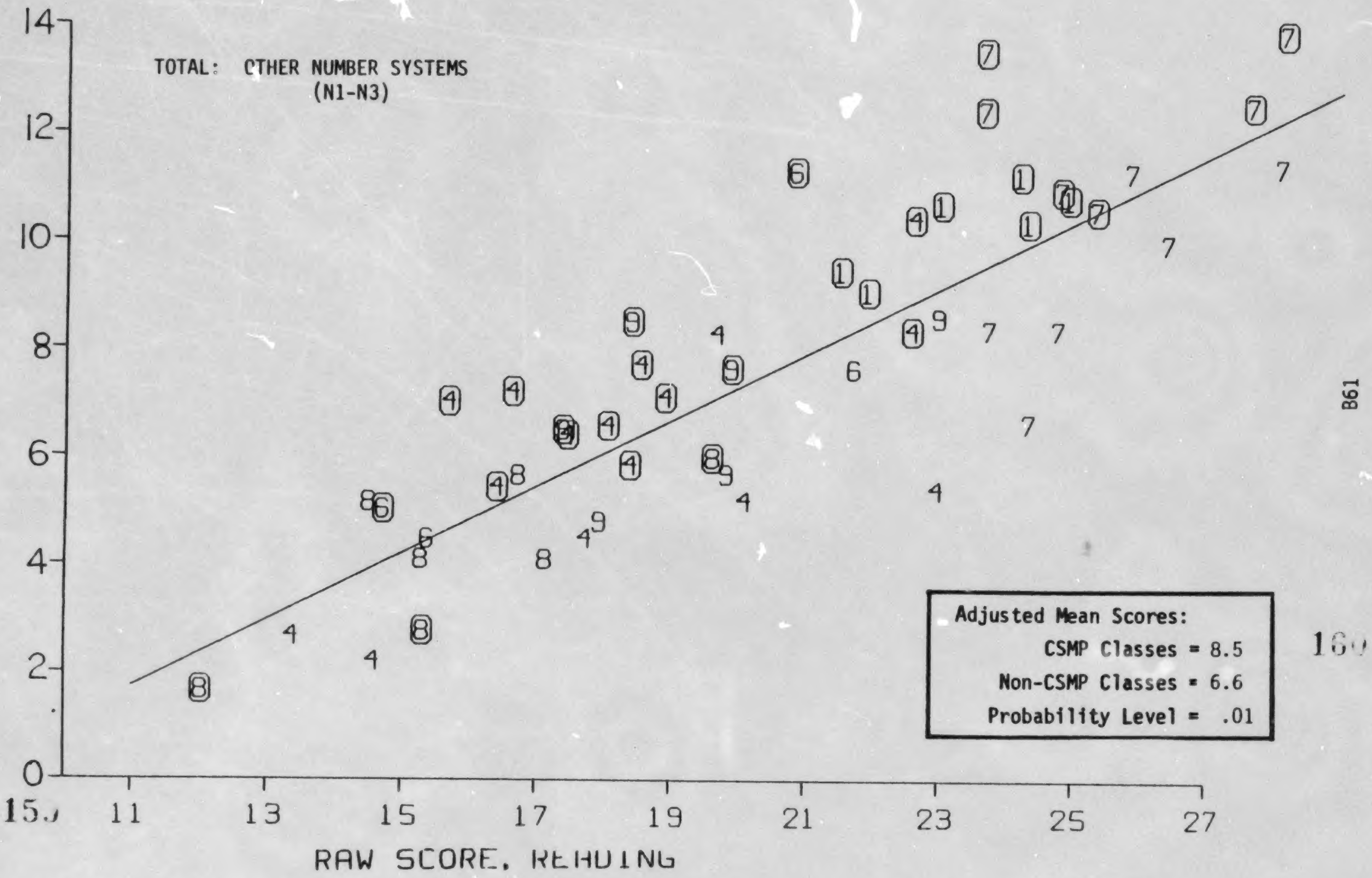
CSMP Classes = 46.3

Non-CSMP Classes = 45.2

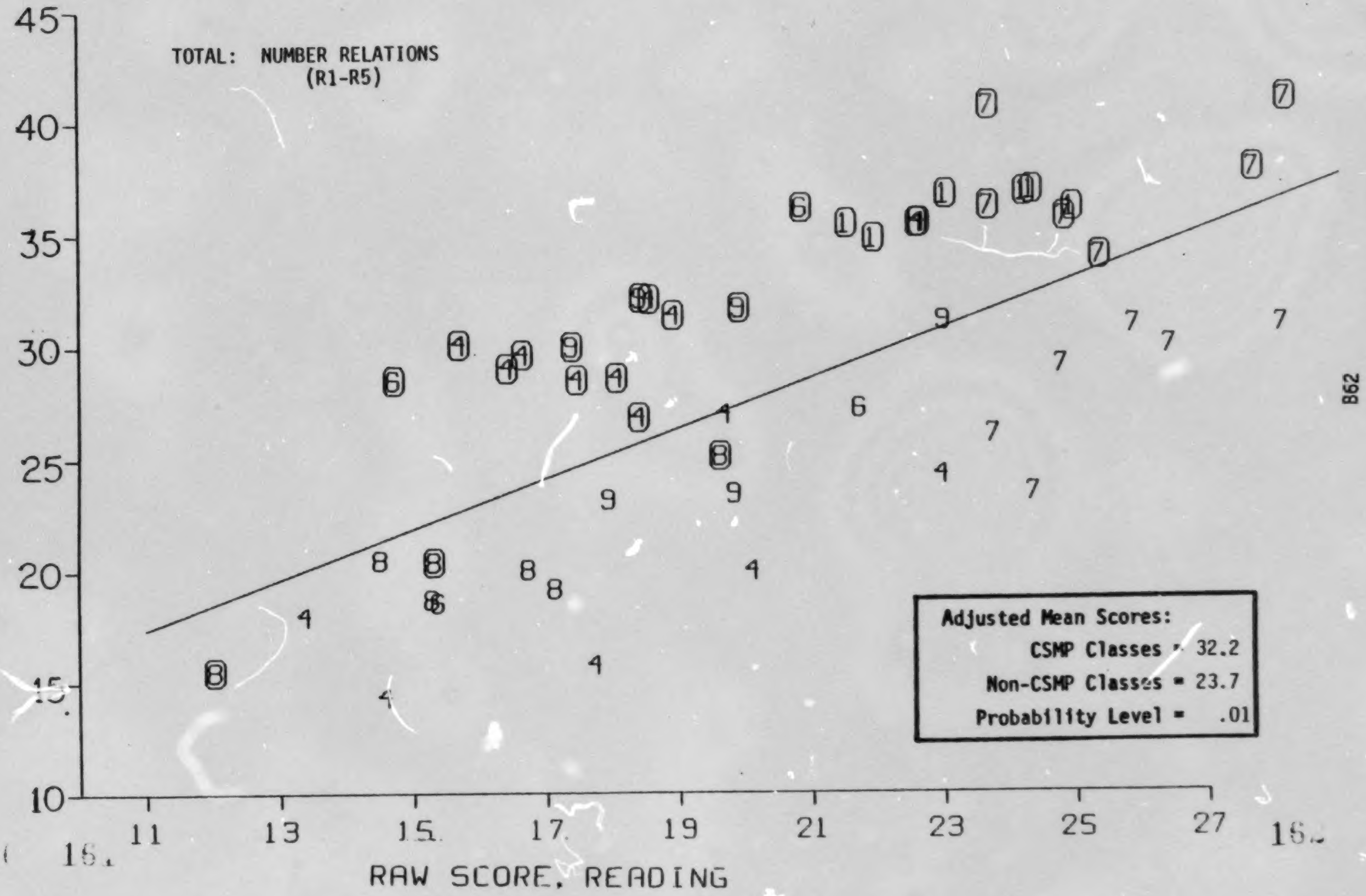
Probability Level = .38

B59


TOTAL: ESTIMATION
(E1-E5)
34
30
26
22
18
14
11
13
15
17
19
21
23
25
27
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 25.6
Non-CSMP Classes = 23.7
Probability Level = .01
B60


TOTAL: OTHER NUMBER SYSTEMS
(N1-N3)
Adjusted Mean Scores:
CSMP Classes = 8.5
Non-CSMP Classes = 6.6
Probability Level = .01
0
2
4
6
8
10
12
14
15.J
11
13
15
17
19
21
23
25
27
RAW SCORE, READING

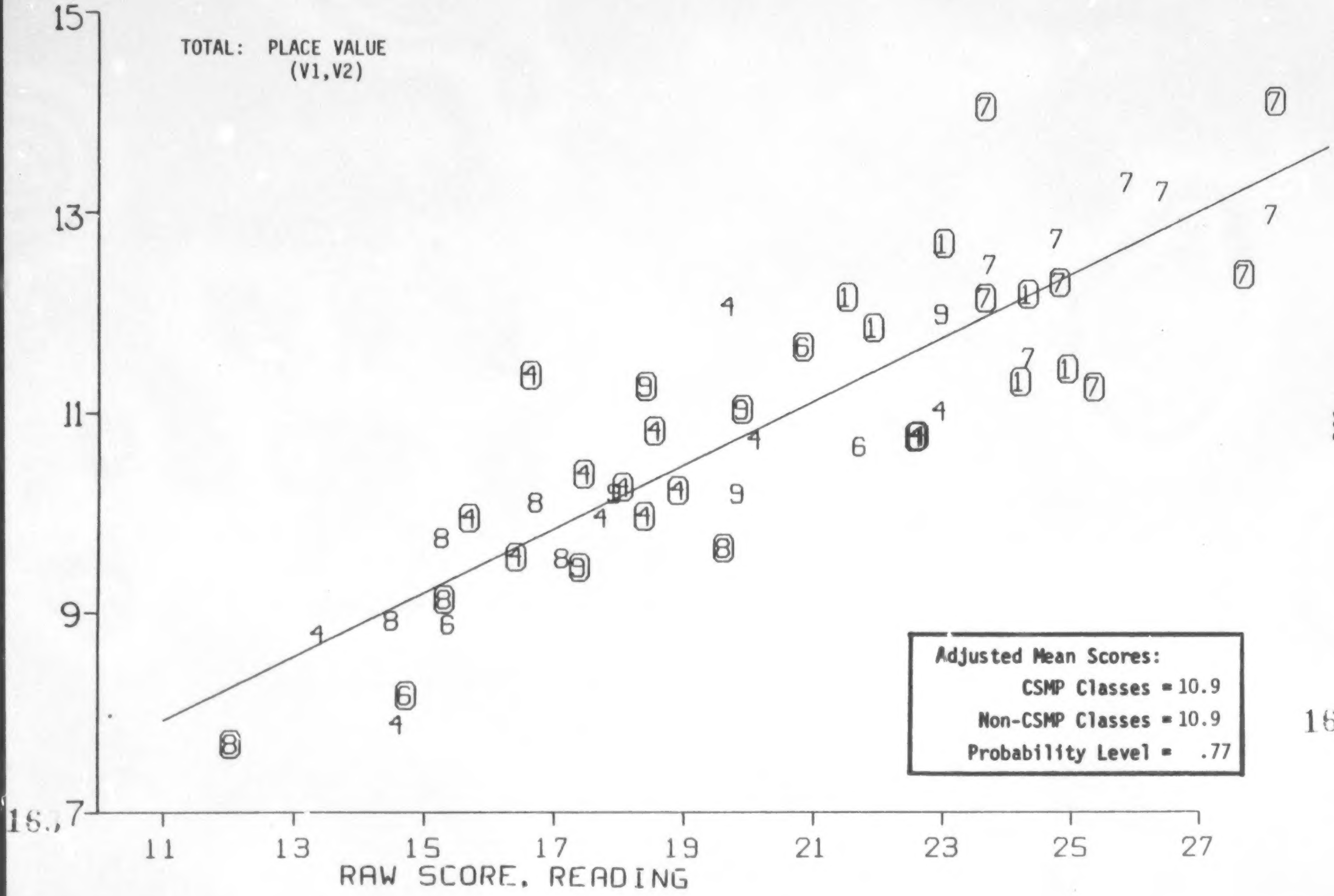
B61



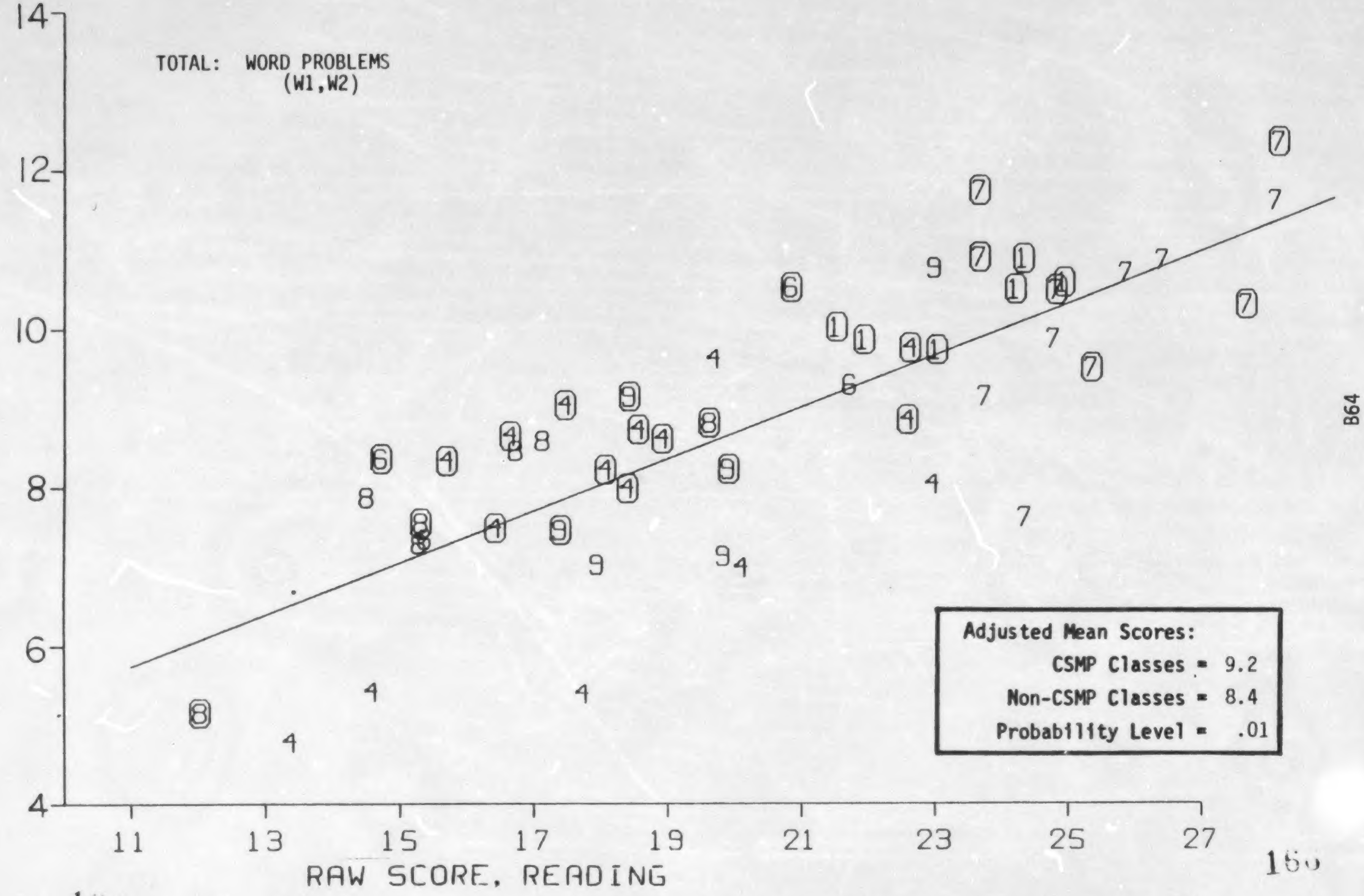
TOTAL: NUMBER RELATIONS
(R1-R5)

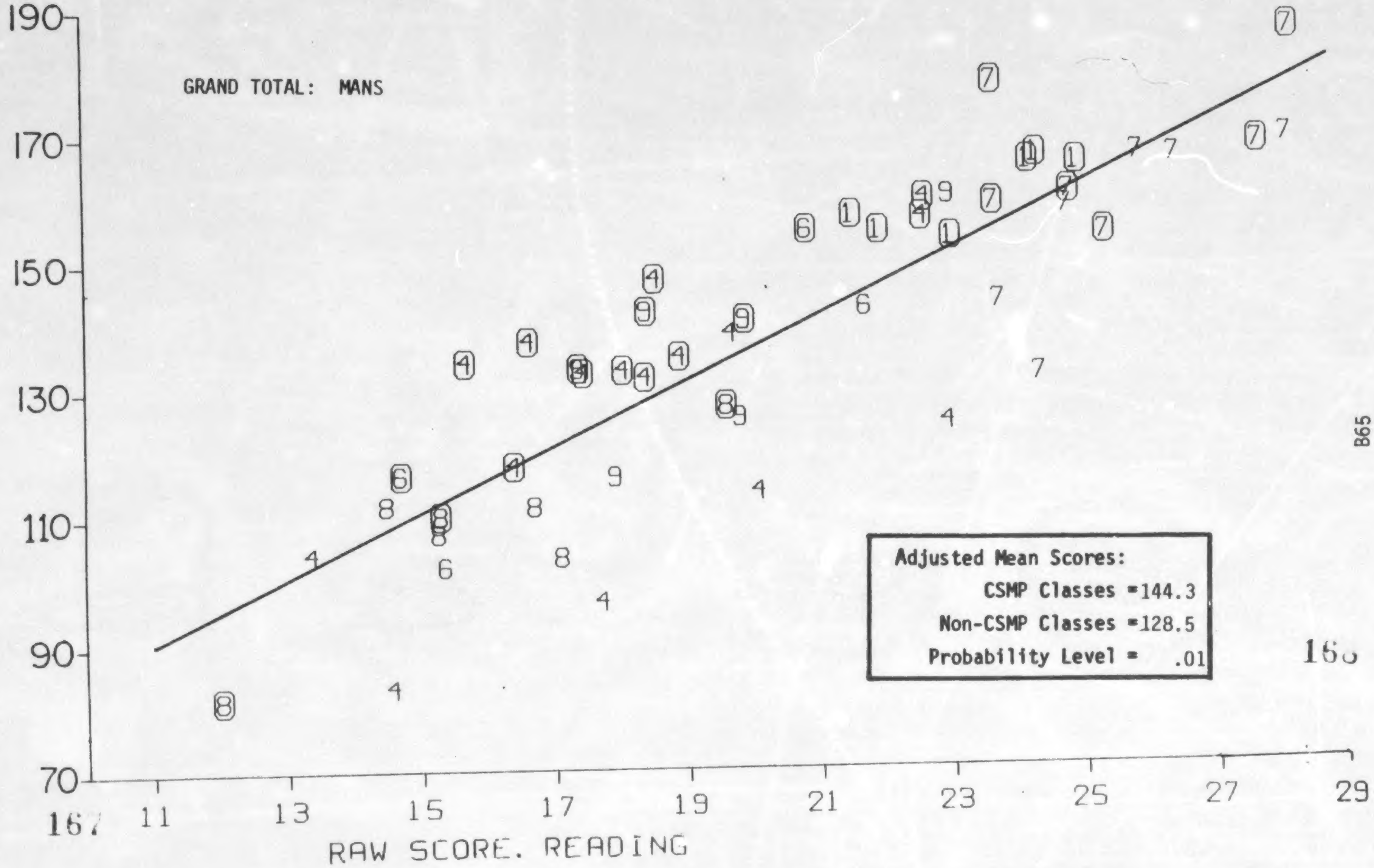
Adjusted Mean Scores:
CSMP Classes = 32.2
Non-CSMP Classes = 23.7
Probability Level = .01

B62


TOTAL: PLACE VALUE
(V1,V2)
15
13
11
9
7
11
13
15
17
19
21
23
25
27
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 10.9
Non-CSMP Classes = 10.9
Probability Level = .77

B63


TOTAL: WORD PROBLEMS
(W1,W2)
14
12
10
8
6
4
11
13
15
17
19
21
23
25
27
RAW SCORE, READING
Adjusted Mean Scores:
CSMP Classes = 9.2
Non-CSMP Classes = 8.4
Probability Level = .01
B64



Adjusted Mean Scores:

CSMP Classes =144.3

Non-CSMP Classes =128.5

Probability Level = .01

B65